

LA-UR-18-23788

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Title: Information Files of 238 U(n,f)/ 235 U(n,f) NIFFTE fissionTPC
Cross-sections for the Neutron Data Standards Project

Author(s): Neudecker, Denise
Otuka, Naohiko
Casperson, Robert J.
Bowden, Nathaniel S.
Snyder, Luke
Schmitt, Kyle Thomas
White, Morgan Curtis
Talou, Patrick

Intended for: Report

Issued: 2018-05-02

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Information Files of $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ NIFFTE fissionTPC Cross-sections for the Neutron Data Standards Project

D. Neudecker^{a*}, N. Otuka^b, R.J. Casperson^c, N.S. Bowden^c, L. Snyder^c, K.T. Schmitt^a,
M.C. White^a, P. Talou^a

^a Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA

^b International Atomic Energy Agency, A-1400 Vienna, Austria

^c Lawrence Livermore National Laboratory, Livermore, California 94550, USA

April 26, 2018

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Abstract

This report documents input files, output files and underlying assumptions for an uncertainty estimate for nuclear data evaluations purposes of the normalized $^{238}\text{U}/^{235}\text{U}$ neutron-induced fission cross-section ratios, $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$, measured by the NIFFTE fission Time Projection Chamber (fissionTPC). This uncertainty estimate and the resulting files were based on information provided by fissionTPC experimentalists, R.J.Casperon, N.S. Bowden, L. Snyder and K.T. Schmitt, and an EXFOR file compiled by N. Otuka. These files were generated for the Neutron Data Standards project coordinated by the IAEA in order to simplify the incorporation of $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data into the standards database.

Keywords: $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$, NIFFTE fissionTPC, Experimental Covariance Matrices and Uncertainties for Nuclear Data Evaluation, Neutron Data Standards Evaluation.

LA-UR-18-xxxxxx

*E-mail of author: dneudecker@lanl.gov

1 Introduction

Recently $^{238}\text{U}/^{235}\text{U}$ neutron-induced fission cross-section ratios, $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$, measured by the NIFFTE fission Time Projection Chamber (fissionTPC) [1–3] were published in Ref. [4]. Both the $^{238}\text{U}(\text{n},\text{f})$ and $^{235}\text{U}(\text{n},\text{f})$ cross-sections are evaluated as part of the Neutron Data Standards project coordinated by the IAEA [5]. Data by the Neutron Data Standards projects are in turn often included in international nuclear data libraries, ENDF/B-VII.1 [6] and ENDF/B-VIII.0 [7] among them, which provide nuclear data for nuclear application calculations. Hence, the $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data could possibly provide input for the Neutron Data Standards project and thus can aid in informing international nuclear data libraries and consequently nuclear application calculations.

In order to facilitate the inclusion of $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data into GMA [8], the database and code underlying the Neutron Data Standards efforts, an EXFOR [10] formatted file was produced. Similar, also EXFOR formatted, files are often used as information files for many GMA database sets describing the input for GMA even if the files themselves are not inputs for the GMA code. Here, details in producing an EXFOR formatted file of the $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data as information file for GMA are presented as well as the resulting file itself (see Section 3.2). The resulting EXFOR formatted file was based on an EXFOR file compiled by N. Otuka for these data. However, GMA cannot use the data in the form presented in the EXFOR entry and a few approximations had to be made which are summarized in Section 3.1. For some approximations, the code **ARIADNE** [9] was used. This code aids in estimating uncertainties of experimental data. The input deck, output plots and approximations are shown and discussed in Section 2. Section 2.3 discusses the differences between total uncertainties of $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data shown in Fig. 18 of Ref. [4] and those obtained by **ARIADNE**. All uncertainties were estimated in close collaboration and ongoing discussion with fissionTPC experimentalists R.J. Casperson, N.S. Bowden, L. Snyder and K.T. Schmitt. M.C. White and P. Talou also participated in some of these discussions and raised important questions. The data, partial uncertainties and correlation matrices for this uncertainty estimate were provided by R.J. Casperson in private communication in March and April 2018. The report ends with a short summary in Section 4.

2 ARIADNE Uncertainty Estimate

The **ARIADNE** code was used to calculate energy uncertainties relative to the incident neutron energy for $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data. In Ref. [5], a time resolution of 2.03 ns (FWHM), time of flight (TOF) length of 8.059 m and a TOF length uncertainty of 3 mm are provided. These three values can be used to calculate an uncertainty relative to the fission cross-section ratio. However, GMA cannot convert time resolution in ns and TOF length uncertainty in length units to an uncertainty relative to the fission cross-section ratio. Instead it accepts an uncertainty relative to the energy of the fission cross-section ratio with the headings "EN-ERR" and "EN-RSL" in the EXFOR formatted information file for GMA. Therefore, **ARIADNE** was used to calculate uncertainties relative to the incident neutron energy stemming from the time resolution and the TOF length uncertainties. It should be mentioned that **ARIADNE** energy uncertainties provided in the output file in Section A are given relative to the ratio cross-section rather than relative incident neutron energy as in the EXFOR formatted file in Section 3.2. **ARIADNE** was also used to calculate the mid-point of the incident neutron energy bins provided by R.J. Casperson. Again, GMA does not accept energy-bins but rather one incident neutron energy per data point. The mid-point of each bin was chosen as this one incident neutron energy per data point based on discussion with R.J. Casperson.

The full **ARIADNE** uncertainty estimate including the input deck, output plots and file is documented here as it contains documentation on the private communication with fissionTPC experimentalists and might be useful for Neutron Data Standards evaluators when comparing their uncertainty estimate to the one obtained by **ARIADNE**.

2.1 Approximations for the **ARIADNE** Input

Here, the approximations made as part of the **ARIADNE** uncertainty estimate of $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data are summarized. R.J. Casperson provided data, partial uncertainties and correlation matrices for all partial uncertainties in private communication. The different uncertainty sources were discussed at length with R.J. Casperson, N.S. Bowden, L. Snyder, K.T. Schmitt, M.C. White and P. Talou and it was concluded that all possible uncertainties known at present are accounted for. Hence, no additional uncertainties had to be added into the **ARIADNE** code which were not described in Ref. [4]. The only approximations that had to be made concerned the shape of the partial correlation matrix. The current version of **ARIADNE** defines the shape of a correlation matrix of partial uncertainties by keywords identifying correlation matrix shapes typically used by evaluators for partial correlation matrices. **ARIADNE** does not use correlation matrices explicitly given by experimentalists at them moment as this information is only very rarely available.

The correlation matrices supplied by R.J. Casperson for the contamination correction, detector efficiency correction, wrap around background correction and variational uncertainties are shown in the upper part of Fig. 1. A correlation matrix for statistical uncertainties was also supplied. This correlation matrix had off-diagonal entries very close to zero which only were non-zero because of Monte Carlo noise according to R.J. Casperson. Hence, the diagonal correlation matrix used for the **ARIADNE** input is a very close approximation. The contamination uncertainty correlation matrix in the upper left-hand side of Fig. 1 is very close to fully correlated, while the efficiency correlation matrix on the right-hand side is nearly diagonal. Hence, the assumption of fully correlated and diagonal correlation matrices in **ARIADNE** describe these correlation matrices well.

The variational correlation matrix was described with the Gaussian anti-correlated shape in the bottom part on the left-hand side of Fig. 1 which describes the original correlation matrix on average in a visual comparison. The correlation matrix assumed in **ARIADNE** for the wrap around background correction differs visibly above 1.5 MeV incident neutron energy from the original one. However, in this energy range the wrap around background uncertainty is about a factor 10 smaller than the statistical uncertainty which is the dominant uncertainty source as can be seen in Fig. 18 of Ref. [4]. Hence, this

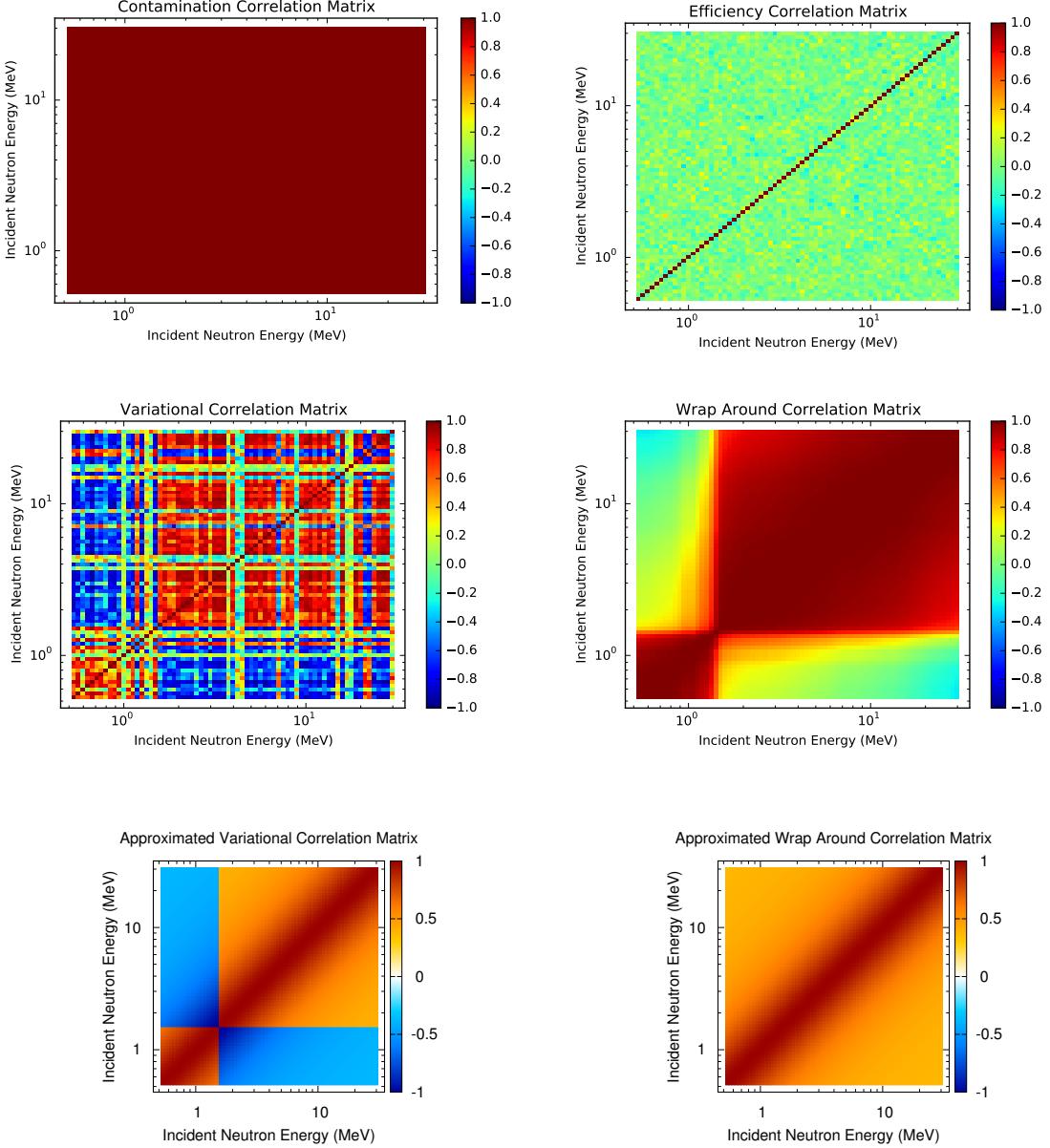


Figure 1: Correlation matrices of partial uncertainties as provided by R.J. Casperson are shown in the upper and middle part of the figure, while in the bottom part **ARIADNE** approximations for the variational and wrap around background correlation matrices are shown.

poor approximation above 1.5 MeV does not impact the uncertainty estimate significantly.

2.2 ARIADNE Input File

Below, the **ARIADNE** input file is shown including comments on the uncertainty estimate. A few of the output plots automatically generated by **ARIADNE** are shown in Fig. 2.

```
cd /home/dneudecker/pu-239-neutron-induced-fission-cross-section/ARIADNE/src/
homedir = '/home/dneudecker/pu-239-neutron-induced-fission-cross-section/ARIADNE/WorkDir/U-238/nfcs_DS8030/'
import Class_nfcs as Cnf
reload(Cnf)
```

```
# Data in here are all provided in private communication by Robert Casperson.
from numpy import array, shape, ones, zeros
```

```
datafile = homedir+'DS8030.dat'
alldata = loadtxt(datafile,skiprows=2)
Einc = 0.5*(alldata[:,0]+alldata[:,1]) # The incident neutron energy is supplied
# in the form of a lower and upper bin edge. ARIADNE as well as GMA cannot deal
# with that. Instead, an Einc per each data value needs to be supplied. I take
# the mid-point of the energy bin as this one-point energy. This procedure was
# discussed with R. Casperson in private communication and he agreed that this
# is acceptable.
```

```
GR
Data = alldata[:,2] # shape U-238(n,f)/U-235(n,f), the data are normalized to
# ENDF/B-VIII.0beta3 at 14.5 MeV and will be treated as shape data in GMA.
```

```
statunc = alldata[:,4] # %, The statistical uncertainty is explicitly supplied
# by the experimentalist.
```

```
deteffunc1 = alldata[:,5] # %, The first detector efficiency uncertainty is the
# "variational" unc. in Fig. 18 which accounts for the variation in the PID cuts.
# The correlation matrix is Gaussian anti-correlated with a turning point
# at Einc = 1.5404 MeV and a damping term of 1 in a visual comparison with
# that option of ARIADNE and the partial correlation matrix provided by R.
# Casperson.
```

```
background = alldata[:,6] # %, The background uncertainty accounts for background
# correction uncertainties related to the wrap-around background. Background due to
# fission fragment recoils and a-particles is zero because they are clearly identified
```

```

# by PID cuts. The unc. in the variation of the PID cut is the variational unc.
# The correlation matrix provided by R. Casperson is best approximated with a
# Gaussian with a damping term of 1 in a visual comparison with
# that option of ARIADNE and the partial correlation matrix provided by R.
# Casperson for Einc up to 1.5 MeV. Above the unc. of the wrap around is negligibly
# small compared to other uncertainties, so an exact reproduction of the original
# correlation matrix is not needed.

deteffunc2 = alldata[:,7] #%, The second efficiency uncertainty accounts for uncertainties
# in the efficiency model such as in the SRIM stopping power assumption, FY unc., etc.,
# The correlation matrix is on average diagonal in a visual comparison with the partial
# correlation matrix provided by R. Casperson in private communication. Correlations
# to other measurements could arise because of common usage of SRIM. However, the correlation
# matrix is diagonal to begin with. If it was not diagonal, all Einc would be
# affected by the cross-correlations according to a discussion with R. Casperson.

```

```
impurity = alldata[:,8] # %, The impurity uncertainty accounts for contaminations in  
# the sample. The correlation matrix is fully correlated in a visual comparison with  
# the data provided by R. Casperson. This uncertainty could be correlated to other  
# measurements due to usage of alpha-counting and related nuclear data.
```

```

# Information found in the paper:
TOFlength = 8.059 # m
TOFlength_unc = 3 # mm
trsl = 2.03/2.355 # ns. The time resolution is divided by
# a factor of 2.355 because it is given at FWHM rather
# than the 1-sigma level.

```

Documentation = """EXFOR No. = wip; the data are not yet in GMA, following the current numbering \ and convention, I would assign DS8030; Journal article = R.J. Casperson et al., PRC 97, \ 034618 (2018). The data used in here are all provided in private communication by Robert \

Casperson. The incident neutron energy is supplied in the form of a lower and upper bin edge. \ ARIADNE as well as GMA cannot deal with that. Instead, an Einc per each data value needs to \ be supplied. I take the mid-point of the energy bin as this one-point energy. This procedure \ was discussed with R. Casperson in private communication and he agreed that this is \ acceptable. The data are shape U-238(n,f)/U-235(n,f) data normalized to ENDF/B-VIII.0beta3 \ at 14.5 MeV and will be treated as shape data in GMA. The statistical uncertainty is \ explicitly supplied by the experimentalist and the correlation matrix is assumed to be \ diagonal. The first detector efficiency uncertainty is the "variational" unc. in Fig. 18 \ which accounts for the variation in the PID cuts. The correlation matrix is Gaussian \ anti-correlated with a turning point at Einc = 1.5404 MeV and a damping term of 1 in a \ visual comparison with that option of ARIADNE and the partial correlation matrix provided \ by R. Casperson. The background uncertainty accounts for background correction uncertainties \ related to the wrap-around background. Background due to fission fragment recoils and alpha-\ particles is zero because they are clearly identified by PID cuts. The unc. in the variation \ of the PID cut is the variational unc. The correlation matrix provided by R. Casperson is \ best approximated with a Gaussian and a damping term of 1 in a visual comparison with that \ option of ARIADNE and the partial correlation matrix provided by R. Casperson for Einc up to\ 1.5 MeV. Above the unc. of the wrap around is negligibly small compared to other uncertainties,\ so an exact reproduction of the original correlation matrix is not needed. \

The second efficiency uncertainty accounts for \ uncertainties in the efficiency model such as in the SRIM stopping power assumption, FY unc., \ etc., The correlation matrix is on average diagonal in a visual comparison with the partial \ correlation matrix provided by R. Casperson in private communication. Correlations to other \ measurements could arise because of common usage of SRIM. However, the correlation matrix is \ diagonal to begin with. If it was not diagonal, all Einc of different exp. would be correlated due \ to common usage of SRIM according to a discussion with R. Casperson. The impurity uncertainty \ accounts for contaminations in the sample. The correlation matrix is fully correlated in a \ visual comparison with the data provided by R. Casperson. This uncertainty could be \ correlated to other measurements due to usage of alpha-counting and related nuclear data. \ No normalization unc. needs to be accounted for as this is a shape measurement. Attenuation \ and multiple scattering uncertainties are negligible according to R. Casperson as both \ samples are on the same side. The FF angular distribution uncertainty is part of the \ detector efficiency uncertainty. The energy uncertainty is obtained by accounting for \ the TOF length unc. and trsl which is provided in the journal article. The dead time \ uncertainty is zero according to R. Casperson due to improved electronics. The flux \

uncertainty would just result in a constant fully correlated unc. which drops out \ because the data given here are U-238(n,f)/U-235(n,f) SHAPE data. Private \ communication took place in LLNL, by phone meeting and e-mail exchange in the time-frame\ from March-April 2018, R. Casperson, L. Snyder, N. Bowden, P. Talou, M.C. White and \ Naohiko Otuka were involved in that exchange."""

```
general_info = {'name': 'DS8030', 'isotope': 'U-238', 'quantity': 'cs', 'reaction': 'n,f', \
    'output_file' : homedir+'DS8030.xml', \
    'output_folder' : homedir, \
    'documentation' : Documentation}
```

```
einc_unc = {'tof_length': {'value': TOFlength , 'value_unit': 'm', \
    'unc': TOFlength_unc, 'unc_unit': 'mm'}, \
    'trsl' : {'value': trsl, 'unit': 'ns'},\
    'identifier_iso_deriv1' : 'ENDF/B-VII.1'}
```

```
∞ reference = {'isotope': 'U-235', 'quantity': 'cs', 'reaction': 'n,f', 'identifier': 'ENDF/B-VII.1'}
```

```
unc_iso = {'einc_unc': einc_unc, \
    'values':array([statunc,deteffunc1,background,\n        deteffunc2,impurity]).transpose(),\
    'units':[ '%', '%', '%', '%', '%' ], \
    'type':[ 'Diagonal', 'Gaussian-Anticorrelated', 'Gaussian', \
        'Diagonal', 'Positive_fully' ], \
    'type_arg':{ 'einc':array(Einc), 'damp_term':[1.0,1.0,1.0,1.0,1.0], \
        'eout-turningpoint':[0.0,1.5404,0.0,0.0,0.0] } }
```

```
data = {'einc': array(Einc), 'einc_unit': 'MeV', 'values':array(Data), 'values_unit': "none" }
```

```
DS8030_nfcs = Cnf.nfcs_cleanratioshape(general_info,data,unc_iso,reference)
```

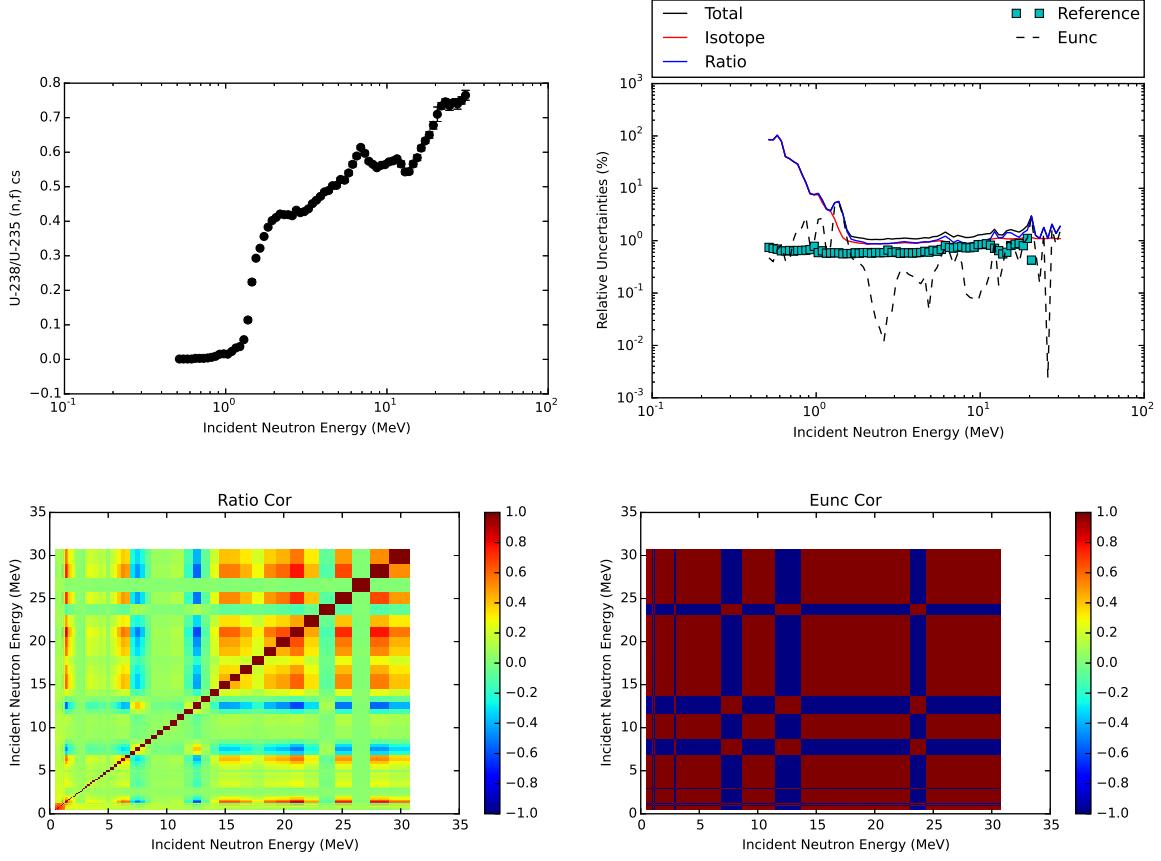


Figure 2: Ratio data, estimated relative uncertainties and estimated total and energy uncertainty correlation matrices are shown for the $^{238}\text{U}(n,f)/^{235}\text{U}(n,f)$ fissionTPC data. The plots were automatically produced by the program **ARIADNE**.

2.3 Comparison to fissionTPC Total Uncertainties

The total uncertainties estimated by **ARIADNE** differ from those given by R.J. Casperson as can be seen in Fig. 3. This difference is caused by the fact that energy uncertainties stemming from the time resolution and TOF length uncertainties are considered in the total uncertainties estimated by **ARIADNE** but are not considered in the total uncertainties by R.J. Casperson. The energy uncertainty is large at incident neutron energies where the slope of the $^{238}\text{U}(n,f)/^{235}\text{U}(n,f)$ ratio cross-section in Fig. 2 is large. It dominates the total uncertainties at about 1.5 and 20 MeV. Otherwise, the statistical uncertainty is the dominating uncertainty source at most incident neutron energies.

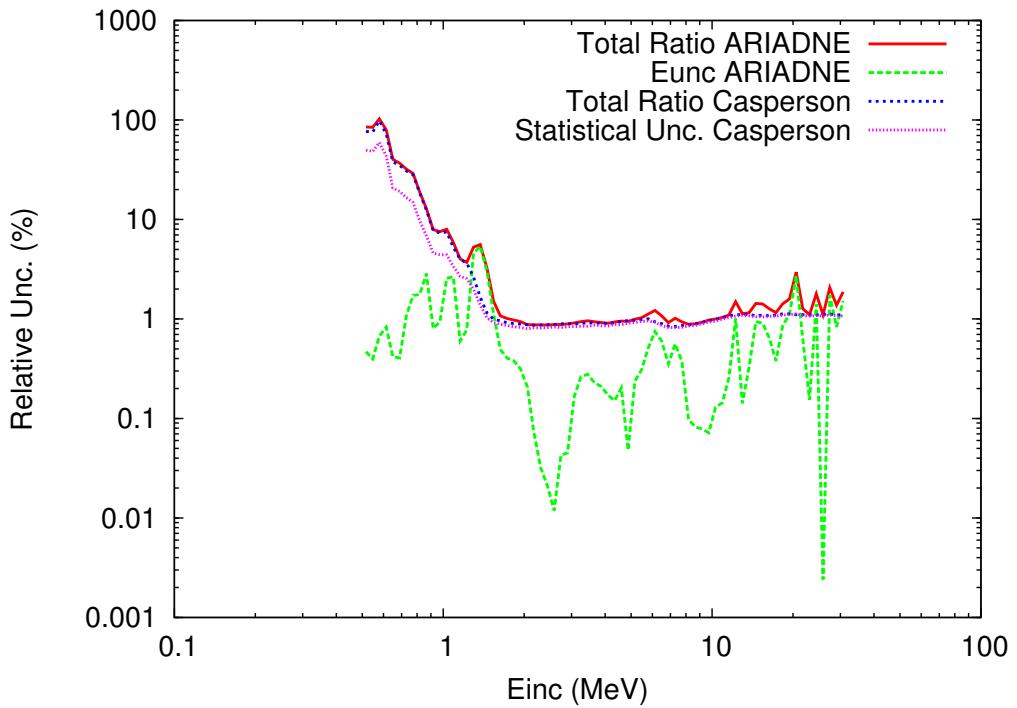


Figure 3: The total relative uncertainties estimated by **ARIADNE** and given by R.J. Casperson are compared. The Fig. also highlights that the difference between these total uncertainties is caused by the energy uncertainty. It is also shown that the statistical uncertainty is the major uncertainty component of this measurement at most incident neutron energies.

3 EXFOR formatted GMA Input Information File

The EXFOR formatted GMA input information file was based on the EXFOR file created by N. Otuka. It was updated to give information in the form as, for instance, many $^{239}\text{Pu}(n,f)$ data files are given as part of EXFOR formatted information files of data in GMA.

3.1 Approximations for the GMA Input

The following approximation had to be made when preparing the EXFOR formatted information file for GMA compared to the original EXFOR file compiled by N. Otuka:

- As mentioned above, an incident energy mid-point value was given instead of the incident energy bins originally provided by R.J. Casperson.
- The time resolution and TOF length uncertainties were converted into energy uncertainties relative to the incident neutron energies via the code **ARIADNE**. These uncertainties are given combined under the heading EN-ERR. The time resolution and TOF length uncertainties should actually be given separately, as was done in the **ARIADNE** input file, because these two uncertainty sources are independent. However, it was not clear how GMA treats the headings EN-ERR and EN-RSL internally. Therefore, both uncertainties were combined into one. This approximation should impact the final uncertainty estimate only negligibly given that the uncertainty resulting from the TOF length uncertainty is approximately a factor 10 smaller than the uncertainty resulting from the time resolution. The energy uncertainty is fully correlated in energy space.
- The detector efficiency and contamination correlation matrices are approximated by "SERC" (diagonal) and "LERC" (full) correlation matrices. These assumed shapes approximate the correlation matrices in Fig. 1 well.

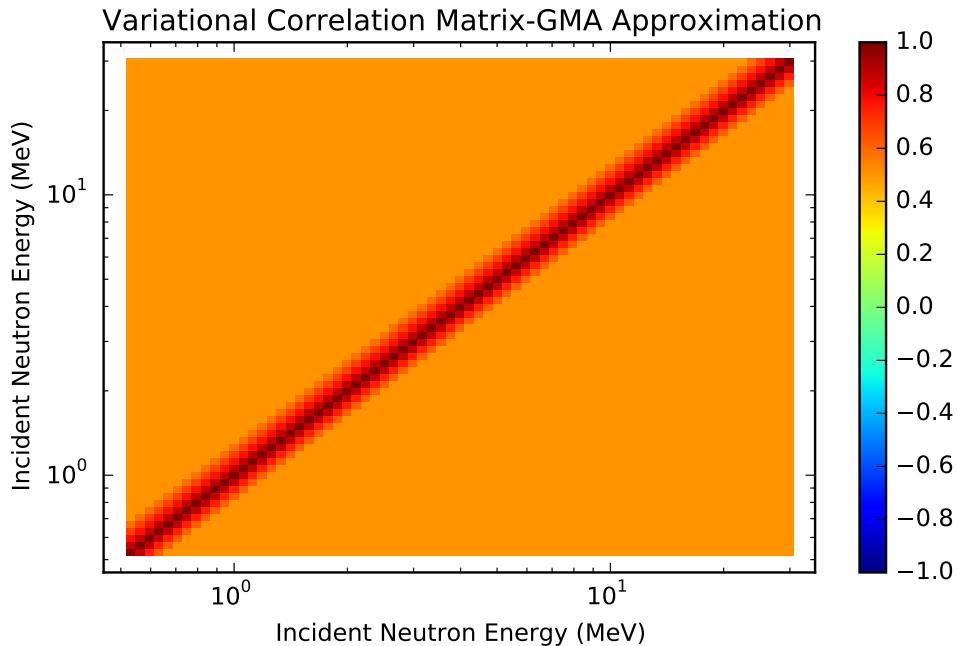


Figure 4: The MERC type correlation matrix used in the EXFOR formatted GMA input information file to approximate the variational correlation matrix is shown.

- The correlation matrices for the variational and wrap around background correction uncertainties are explicitly given. In case Neutron Data Standards evaluators prefer to use the GMA keywords representing correlation shapes, approximations of those were provided. The wrap around background correction was approximated with a LERC correlation matrix given that the original correlation matrix is nearly fully correlated in an energy range (smaller than 1.5 MeV) where this uncertainty source is non-negligible in Fig. 18 of Ref. [4]. The variational correlation matrix is approximated with the "MERC" keyword and shown in Fig. 4. The correlation matrix is parameterized dependent on the incident neutron energy pairs E_i and E_j by:

$$\text{Cor}^{MERC}(E_i, E_j) = \begin{cases} a_k(a_k + b_k) & \text{for } |E_i - E_j| \geq b_k c_k E_i \\ (a_k + b_k) \left(a_k k + b_k - \frac{|E_i - E_j|}{c_k E_i} \right) & \text{else} \end{cases} \quad (1)$$

For the matrix used here, $a_k = b_k = c_k = 0.5$. This assumed correlation matrix does not describe the original correlation matrix very well.

3.2 The EXFOR formatted GMA Input Information File

ENTRY Z8030 20180417
SUBENT Z8030001 20180417
BIB 16 946
TITLE Measurement of the normalized $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$
cross section ratio from threshold to 30 MeV with
the NIFFTE fission Time Projection Chamber
AUTHOR (R.J.Casperson, D.M.Asner, J.Baker, R.G.Baker,
J.S.Barrett, N.S.Bowden, C.Brune, J.Bundgaard,
E.Burgett, D.A.Cebra, T.Classen, M.Cunningham,
J.Deaven, D.L.Duke, I.Ferguson, J.Gearhart,
V.Geppert-Kleinrath, U.Greife, S.Grimes,
E.Guardincerri, U.Hager, C.Hagmann, M.Heffner,
D.Hensle, N.Hertel, D.Higgins, T.Hill, L.D.Isenhower,
J.King, J.L.Klay, N.Kornilov, R.Kudo, A.B.Laptev,
W.Loveland, M.Lynch, W.S.Lynn, J.A.Magee, B.Manning,
T.N.Massey, C.McGrath, R.Meharchand, M.P.Mendenhall,
L.Montoya, N.T.Pickle, H.Qu, J.Ruz, S.Sangiorgio,
K.T.Schmitt, B.Seilhan, S.Sharma, L.Snyder, S.Stave,
A.C.Tate, G.Tatishvili, R.T.Thornton, F.Tovesson,
D.E.Towell, R.S.Towell, N.Walsh, S.Watson, B.Wendt,
L.Wood, L.Yao, W.Younes)
INSTITUTE (1USALRL,1USABNW,1USAIRNL,1USAORU,1USAOHO,1USACSM,
1USAISU,1USADAV,1USALAS,1USAGIT)
(1USAUSA) California Polytechnic State Univ., San Luis
Obispo, CA
(1USAUSA) Abilene Christian Univ., Abline, TX
REFERENCE (J,PR/C,97,034618,2018)
REL-REF (I,,M.Heffner+,J,NIM/A,759,50,2014)
Description on Time Projection
(I,,L.Snyder+,J,NIM/A,881,1,2018)
Description on Time Projection Chamber
(I,,N.S.Bowden+,J,NIM/A,624,153,2010)
Description on Time Projection Chamber
FACILITY (LINAC,1USALAS) LANSCE WNR 90L beam line
INC-SOURCE (SPALL) 800 MeV proton on W neutron production target

SAMPLE Half-disk targets of 238U and 235U on a thin
100 ug/cm² carbon backing.
(92-U-238,ENR=0.994)
238U (99.4%) with
233U (0.0003%), 234U (0.0046%), 235U (0.57%),
236U (0.005%)
(92-U-235,ENR=0.9969)
235U (99.69%) with
233U (0.002%), 234U (0.060%), 236U (0.25%)

DETECTOR (TPC) NIFFTE fission Time Projection Chamber

METHOD (TOF) Flight path of 8.059+/-0.003 m.
Time resolution is 2.03+/-0.02 ns FWHM.

ANALYSIS Shape ratio measurement normalized to
ENDF/B-VIII.0beta3 at 14.5 MeV.

CORRECTION Corrected for

- number of background recoil events misidentified as
fission fragments
- number of pile-up alpha-particle events
misidentified as fission fragments
- number of events in high-energy region from
low-energy contributions in earlier bunches
("wrap-around")
- presence of 235U in 238U target ("contaminant")
- No correction for dead time, which is zero thanks
to the electronics set-up.

R.J.Casperson via D.Neudecker (2018-04-03):
The 235U and 238U targets are on the same side of the
detector, and it eliminates a lot of corrections due
to attenuation and multiple scattering.

GMA only takes one incident energy per data value
while the TPC collaboration provided energy bins. DN
took the mid-point as incident energy in this file as
agreed upon with R.J.Casperson.

ERR-ANALYS Multiple scattering and attenuation correction
uncertainties are negligible.

Dead time uncertainty is zero.

Sample Mass uncertainty need not be accounted for as the data are shape data.

The neutron flux uncertainty is negligibly small and would be a constant fully correlated uncertainty, i.e., a normalization uncertainty which is not accounted for, as these data are shape data.

(EN-ERR,,,LERC) LERC: the energy uncertainty was calculated with ARIADNE from using a time resolution of 2.03 ns (FWHM) and a TOF length uncertainty of 3 mm with a TOF length of 8.059 m. The energy uncertainty is given in energy space and is fully correlated in energy space. These two uncertainty sources are combined into one.

(ERR-14,,,MERC="LIN,0.5") MERC: Particle identification cuts. The original correlation matrix was correlated above and below fission threshold, but anti-correlated between the two regions. The uncertainty source is a major uncertainty source until about 1.5 MeV and is negligible above. Up to 1.5 MeV, the correlation matrix is best approximated by the chosen function. The original correlation matrix is given.

(ERR-15,,,LERC) LERC: Wrap-around correction. The original correlation matrix is correlated above and below fission threshold, but mostly uncorrelated between the two regions. Up to 1 MeV, it is nearly fully correlated. DN assumed a full correlation for all energies as above 1 MeV this uncertainty source is negligible compared to other uncertainty sources of this measurement. Other measurement backgrounds are removed by particle identification cuts and hence these background uncertainties are either zero or accounted for in ERR-14. The original correlation matrix is given.

(ERR-16,,,SERC) SERC: Efficiency correction including

- (1) uncertainty due to fission fragment angular distribution, and
- (2) uncertainty due to fission fragment efficiency model parameter covariances.

The correlation matrix is well approximated by a diagonal correlation matrix.

(ERR-17,,,LERC) LERC: 235U contaminant correction
The correlation matrix is well approximated by a fully correlated correlation matrix. This uncertainty could be correlated to other measurements due to usage of alpha-counting and related nuclear data.

COVARIANCE Lower triangle part of the 72x72 correlation coefficients are tabulated below for the following components:

- (ERR-14) PID cut
- (ERR-15) Wrap-around

Correlation coefficients (PID cut, ERR-14)

1.0000							
0.6743	1.0000						
0.5828	0.3604	1.0000					
0.6225	0.8495	0.0923	1.0000				
0.8602	0.9120	0.4017	0.8404	1.0000			
0.4236	0.8578	0.1503	0.6756	0.7480	1.0000		
0.5408	0.8444	-0.0075	0.8435	0.8142	0.8147	1.0000	
0.3681	0.5534	-0.1521	0.8054	0.5268	0.3746	0.5863	
1.0000							
0.7740	0.7509	0.7489	0.5284	0.7670	0.4956	0.4362	
0.2521	1.0000						
0.8322	0.7003	0.8333	0.4888	0.7767	0.4309	0.3727	
0.1782	0.9162	1.0000					
0.5210	0.8977	0.0619	0.8470	0.8337	0.8895	0.8974	
0.5817	0.5056	0.4386	1.0000				
-0.0527	0.0266	-0.2972	0.1185	-0.0605	0.0172	0.1156	
0.3479	-0.0362	-0.2072	0.1157	1.0000			

0.7596	0.4237	0.8429	0.1865	0.5667	0.1915	0.1406
-0.0247	0.8074	0.8581	0.1454	-0.0837	1.0000	
0.6776	0.8331	0.2649	0.8256	0.8626	0.6301	0.7415
0.6602	0.6785	0.6535	0.7431	0.0899	0.4399	1.0000
-0.7212	-0.5047	-0.8514	-0.3053	-0.5881	-0.2103	-0.1554
-0.0866	-0.8656	-0.9131	-0.1913	0.2141	-0.8818	-0.5059
		1.0000				
0.6962	0.8726	0.1686	0.8988	0.8941	0.7062	0.8322
0.6621	0.6171	0.6148	0.8506	0.0009	0.2790	0.8166
-0.4295	1.0000					
-0.4734	0.0740	-0.6628	0.1652	-0.1411	0.3195	0.3005
0.2641	-0.4258	-0.5461	0.3394	0.3855	-0.7090	0.0121
0.7010	0.0501	1.0000				
-0.1034	0.3298	-0.0470	0.1488	0.2058	0.6144	0.4175
-0.2102	-0.0007	0.0342	0.4256	-0.1313	-0.0837	0.1019
0.1310	0.1823	0.3614	1.0000			
0.7495	0.9304	0.3340	0.8383	0.9550	0.7901	0.8214
0.5263	0.7373	0.7443	0.8759	0.0132	0.4766	0.8537
-0.5442	0.9361	-0.0067	0.3164	1.0000		
-0.6799	-0.4808	-0.5320	-0.4672	-0.5953	-0.0780	-0.2846
-0.2937	-0.6355	-0.7301	-0.2103	0.3741	-0.5817	-0.5284
0.7311	-0.5528	0.6008	0.2559	-0.5126	1.0000	
-0.7754	-0.8376	-0.4208	-0.7442	-0.9075	-0.6538	-0.7120
-0.4426	-0.7182	-0.7473	-0.6803	0.2152	-0.5911	-0.8032
0.6102	-0.7657	0.2256	-0.2218	-0.8460	0.6998	1.0000
-0.5780	-0.6863	-0.0266	-0.8616	-0.7512	-0.4143	-0.7117
-0.7483	-0.4503	-0.4429	-0.6418	0.0484	-0.1697	-0.7983
0.3243	-0.8345	-0.0435	0.0786	-0.7300	0.6450	0.7431
	1.0000					
-0.5384	-0.7937	0.1146	-0.8787	-0.8018	-0.7078	-0.8591
-0.6935	-0.3907	-0.3409	-0.8570	0.0141	-0.0258	-0.7153
0.1531	-0.9127	-0.2274	-0.1888	-0.8135	0.4048	0.7037
0.8313	1.0000					
-0.8580	-0.8096	-0.4761	-0.8254	-0.9028	-0.4873	-0.6381
-0.6112	-0.7975	-0.8106	-0.6422	0.0981	-0.6004	-0.8252

0.7002	-0.8447	0.3235	0.0800	-0.8460	0.7951	0.8764
0.8314	0.7165	1.0000				
-0.9017	-0.6462	-0.6377	-0.5489	-0.8211	-0.3425	-0.4380
-0.2374	-0.8235	-0.8885	-0.4291	0.2584	-0.7777	-0.6609
0.8253	-0.6879	0.5949	0.1094	-0.7407	0.8296	0.7900
0.6059	0.5125	0.8672	1.0000			
-0.9171	-0.6838	-0.6077	-0.5388	-0.8352	-0.4534	-0.4536
-0.2319	-0.8034	-0.8601	-0.5132	0.2396	-0.7344	-0.6128
0.7759	-0.6991	0.5416	0.0605	-0.7514	0.7162	0.7616
0.5136	0.5508	0.8239	0.9444	1.0000		
-0.8794	-0.7992	-0.6235	-0.5851	-0.8945	-0.6285	-0.5883
-0.2264	-0.8378	-0.8790	-0.6041	0.2378	-0.7701	-0.7013
0.7639	-0.6975	0.4391	-0.1696	-0.8149	0.6802	0.8845
0.5168	0.5651	0.8210	0.8999	0.9251	1.0000	
-0.7455	-0.2134	-0.4929	-0.2636	-0.4506	0.1626	-0.0650
-0.1932	-0.5123	-0.6083	-0.0222	0.2263	-0.6088	-0.3238
0.6585	-0.3708	0.6899	0.5207	-0.3306	0.7741	0.4751
0.4486	0.2306	0.6599	0.7646	0.7200	0.5403	1.0000
-0.8008	-0.7272	-0.2407	-0.7754	-0.8341	-0.4168	-0.6135
-0.6252	-0.6476	-0.6479	-0.6439	0.0021	-0.4290	-0.7617
0.5224	-0.8368	0.1780	0.1742	-0.7992	0.7055	0.7810
0.8311	0.7654	0.8996	0.7906	0.7909	0.7134	0.6908
1.0000						
-0.8222	-0.9045	-0.4308	-0.7608	-0.9597	-0.7400	-0.7547
-0.4415	-0.8057	-0.7999	-0.7754	0.1343	-0.5927	-0.8145
0.6498	-0.8698	0.2291	-0.2160	-0.9309	0.6531	0.9139
0.6901	0.7745	0.8817	0.8447	0.8690	0.9340	0.4513
0.8184	1.0000					
-0.7454	-0.3683	-0.8613	-0.1409	-0.5235	-0.1008	-0.0574
0.1105	-0.7806	-0.8563	-0.0665	0.2811	-0.9366	-0.3679
0.8851	-0.2356	0.8034	0.1459	-0.4041	0.6848	0.5909
0.1828	0.0114	0.6083	0.8078	0.7712	0.7699	0.6983
0.4574	0.5796	1.0000				
-0.9076	-0.8439	-0.5351	-0.7118	-0.9396	-0.6189	-0.6593
-0.3934	-0.8526	-0.8660	-0.6721	0.1527	-0.6896	-0.7728

0.7475	-0.8386	0.3646	-0.0765	-0.8903	0.7306	0.8850
0.6684	0.7032	0.9085	0.9278	0.9379	0.9537	0.6124
0.8443	0.9644	0.6795	1.0000			
-0.8554	-0.8647	-0.5640	-0.7569	-0.9269	-0.5961	-0.6333
-0.4729	-0.8865	-0.8807	-0.6882	0.1623	-0.6688	-0.8143
0.7722	-0.8433	0.3436	-0.0177	-0.8895	0.7653	0.8891
0.7294	0.6984	0.9515	0.9079	0.8997	0.9108	0.6012
0.8641	0.9483	0.6724	0.9658	1.0000		
-0.9296	-0.8126	-0.4986	-0.7141	-0.9431	-0.5587	-0.6494
-0.4274	-0.8269	-0.8472	-0.6778	0.0979	-0.6858	-0.7847
0.7135	-0.8355	0.3580	0.0036	-0.8873	0.7211	0.8647
0.6987	0.7048	0.9243	0.9306	0.9394	0.9231	0.6692
0.8942	0.9422	0.6777	0.9772	0.9580	1.0000	
-0.2309	0.2099	-0.0051	-0.0781	-0.0403	0.4611	0.1700
-0.2103	0.1302	-0.0434	0.2422	0.2275	-0.1091	-0.0582
0.1074	-0.0064	0.3947	0.5056	0.0938	0.4305	0.1288
0.3475	0.0234	0.2608	0.2690	0.1563	0.0295	0.5447
0.2735	-0.0374	0.1973	0.0473	0.0838	0.1357	1.0000
-0.8495	-0.5395	-0.4656	-0.5228	-0.7444	-0.1979	-0.3860
-0.3595	-0.6735	-0.7337	-0.3882	0.1821	-0.6397	-0.6699
0.6715	-0.6259	0.4972	0.3466	-0.6343	0.7757	0.6957
0.6738	0.5134	0.8270	0.8914	0.8369	0.7558	0.7987
0.8196	0.7181	0.6755	0.8140	0.8141	0.8670	0.4384
1.0000						
0.1555	0.1596	-0.3440	0.4363	0.2121	0.1336	0.2090
0.5770	-0.1028	-0.0755	0.3805	0.2708	-0.3152	0.1872
0.1890	0.4451	0.2460	-0.2225	0.2633	0.0374	0.0287
-0.3422	-0.4946	-0.2266	-0.0429	-0.1508	0.0490	-0.1048
-0.3841	-0.1392	0.3301	-0.1244	-0.1471	-0.1956	-0.2217
-0.1808	1.0000					
0.0262	0.4749	0.1567	0.3012	0.3130	0.5843	0.3953
0.0094	0.2927	0.2582	0.5346	-0.1382	-0.0609	0.1929
-0.1347	0.4330	0.2302	0.5137	0.4388	0.0110	-0.1327
-0.0993	-0.3446	-0.1435	-0.1267	-0.1995	-0.2426	0.3189
-0.0440	-0.3464	0.0825	-0.2620	-0.2914	-0.1921	0.4855

0.0478	0.1969	1.0000				
-0.8341	-0.8794	-0.3314	-0.8622	-0.9537	-0.6386	-0.7697
-0.6303	-0.7535	-0.7380	-0.7768	0.0589	-0.5095	-0.8601
0.5987	-0.9264	0.1579	-0.0292	-0.9213	0.6967	0.8923
0.8470	0.8482	0.9418	0.8354	0.8286	0.8417	0.5513
0.9153	0.9395	0.4796	0.9394	0.9462	0.9429	0.1280
0.7906	-0.2725	-0.2385	1.0000			
-0.8729	-0.6437	-0.2295	-0.7053	-0.8451	-0.4023	-0.6263
-0.5703	-0.5714	-0.6220	-0.5935	0.0057	-0.5075	-0.7138
0.5070	-0.8023	0.2924	0.1457	-0.7747	0.6525	0.7629
0.7535	0.7416	0.8559	0.8097	0.8195	0.7445	0.7142
0.9136	0.8146	0.4885	0.8458	0.8070	0.9036	0.3517
0.8316	-0.3906	0.0436	0.8849	1.0000		
-0.7515	-0.8911	-0.2688	-0.8907	-0.9398	-0.6918	-0.8228
-0.6087	-0.6751	-0.6786	-0.8198	0.1280	-0.3836	-0.8557
0.4987	-0.9326	0.0435	-0.1691	-0.9215	0.6497	0.8992
0.8833	0.8819	0.9136	0.7538	0.7393	0.7850	0.4380
0.8624	0.9175	0.3920	0.8746	0.8999	0.8812	0.1000
0.7060	-0.2660	-0.3158	0.9544	0.8174	1.0000	
-0.8593	-0.6562	-0.6127	-0.4635	-0.8005	-0.4458	-0.4938
-0.1777	-0.7379	-0.8105	-0.4348	0.2802	-0.7931	-0.6364
0.7259	-0.5650	0.5220	-0.0179	-0.6768	0.7245	0.8546
0.4885	0.4534	0.7664	0.8735	0.8605	0.9299	0.6367
0.6696	0.8274	0.7920	0.8789	0.8227	0.8604	0.1568
0.8040	0.1734	-0.0152	0.7669	0.7355	0.6871	1.0000
-0.8208	-0.8584	-0.2726	-0.8775	-0.9516	-0.6378	-0.7894
-0.6116	-0.6734	-0.7012	-0.7945	0.1086	-0.4331	-0.8355
0.5116	-0.9398	0.1225	-0.1102	-0.9220	0.6735	0.8864
0.8640	0.8712	0.9319	0.8055	0.8028	0.8114	0.5268
0.9093	0.9228	0.4331	0.9050	0.9075	0.9235	0.1774
0.7628	-0.3284	-0.2455	0.9704	0.8943	0.9727	0.7267
			1.0000			
-0.6836	-0.7204	-0.0568	-0.8438	-0.8281	-0.5325	-0.7178
-0.6260	-0.4556	-0.5078	-0.7670	0.0667	-0.1854	-0.7457
0.3145	-0.9093	-0.0341	-0.0451	-0.8284	0.5344	0.6983

0.8573	0.8854	0.8037	0.6683	0.6828	0.6010	0.4732
0.8708	0.7594	0.1989	0.7494	0.7588	0.7989	0.2356
0.7017	-0.5600	-0.2715	0.8625	0.8435	0.8882	0.5141
0.9157	1.0000					
-0.7824	-0.7023	-0.2498	-0.6843	-0.8072	-0.4150	-0.6239
-0.5624	-0.5914	-0.6122	-0.5757	0.0312	-0.4958	-0.6861
0.4908	-0.7177	0.2212	0.1454	-0.7223	0.7315	0.8181
0.7442	0.6936	0.8302	0.7648	0.7476	0.7665	0.6078
0.8729	0.8111	0.4996	0.8199	0.8041	0.8451	0.2972
0.7779	-0.1824	0.0459	0.8679	0.8602	0.7925	0.7794
0.8447	0.7046	1.0000				
0.4552	0.5575	-0.3029	0.6218	0.6146	0.5578	0.7539
0.4499	0.1438	0.1400	0.7366	0.1807	-0.0717	0.4578
0.0913	0.7262	0.3165	0.2509	0.6490	-0.1270	-0.4256
-0.5347	-0.7986	-0.4328	-0.3269	-0.4304	-0.3939	-0.1517
-0.6144	-0.5638	0.1257	-0.5124	-0.4216	-0.5593	0.0620
-0.3535	0.5336	0.2734	-0.6118	-0.6668	-0.6163	-0.3095
-0.6747	-0.7531	-0.5609	1.0000			
-0.4667	-0.6241	0.0268	-0.6719	-0.6440	-0.5033	-0.7134
-0.4929	-0.4567	-0.3218	-0.6542	-0.1571	-0.1386	-0.6175
0.1775	-0.6997	-0.2493	-0.1306	-0.6719	0.3268	0.5786
0.6955	0.7044	0.5852	0.4443	0.3666	0.4172	0.2249
0.6506	0.5897	0.0701	0.5819	0.5570	0.5812	-0.0972
0.4574	-0.1770	-0.1606	0.6887	0.5754	0.6873	0.3750
0.6733	0.6488	0.5728	-0.5711	1.0000		
-0.7839	-0.7679	-0.5543	-0.6727	-0.8614	-0.5609	-0.5836
-0.3649	-0.7819	-0.8364	-0.5617	0.2009	-0.7078	-0.7657
0.7747	-0.7337	0.3975	-0.1856	-0.8228	0.7278	0.9056
0.6589	0.5883	0.8663	0.8451	0.7840	0.8720	0.5207
0.6907	0.8757	0.6757	0.8866	0.8833	0.8491	0.1333
0.6961	0.0270	-0.1955	0.8409	0.7233	0.8236	0.8239
0.8142	0.6417	0.6949	-0.2836	0.5013	1.0000	
-0.6652	-0.6801	-0.2157	-0.7376	-0.7672	-0.4106	-0.5625
-0.5962	-0.6490	-0.6007	-0.6759	-0.0427	-0.3330	-0.7464
0.4880	-0.8210	0.0790	0.1496	-0.7779	0.5666	0.6145

0.7722	0.7324	0.8035	0.7045	0.6787	0.5860	0.5113
0.8521	0.7292	0.3266	0.7474	0.7915	0.7979	0.1743
0.7470	-0.4795	-0.2653	0.8398	0.7718	0.7935	0.4861
0.8263	0.8503	0.6830	-0.5413	0.7035	0.6256	1.0000
0.4421	-0.0682	0.4774	-0.1676	0.1093	-0.1745	-0.2565
-0.2659	0.3905	0.4113	-0.2061	-0.0140	0.5187	-0.0796
-0.5100	0.0466	-0.6271	-0.2677	0.0779	-0.2029	0.0199
0.1849	0.1470	-0.1570	-0.4512	-0.4923	-0.2850	-0.5482
-0.1763	-0.1568	-0.5299	-0.3219	-0.2245	-0.3143	-0.0320
-0.3344	0.0537	-0.0688	-0.1135	-0.2642	0.0349	-0.2528
-0.0655	-0.0302	-0.0311	-0.0474	0.0255	-0.1791	-0.1657
1.0000						
-0.7553	-0.7825	-0.6899	-0.5167	-0.8089	-0.5700	-0.5010
-0.2314	-0.8798	-0.8934	-0.5223	0.2672	-0.7749	-0.6866
0.8204	-0.6482	0.4789	-0.1198	-0.7601	0.7175	0.8203
0.4819	0.4793	0.8005	0.8508	0.8377	0.9269	0.4761
0.6300	0.8864	0.7667	0.8913	0.8970	0.8460	-0.0222
0.6933	0.1364	-0.2968	0.7847	0.6300	0.7282	0.8559
0.7311	0.4808	0.6926	-0.2125	0.3512	0.8551	0.5501
-0.2442	1.0000					
-0.9211	-0.6845	-0.7043	-0.5852	-0.8335	-0.3705	-0.4282
-0.3765	-0.8668	-0.9299	-0.4551	0.1455	-0.8425	-0.7136
0.8753	-0.6818	0.5703	0.1422	-0.7579	0.7970	0.8107
0.5975	0.4686	0.9087	0.9389	0.9071	0.8837	0.7582
0.7977	0.8364	0.8253	0.9131	0.9193	0.9205	0.2560
0.8608	-0.0656	-0.0658	0.8437	0.8143	0.7480	0.8656
0.8008	0.6287	0.7710	-0.2569	0.4216	0.8681	0.7024
-0.4150	0.8644	1.0000				
-0.8594	-0.8699	-0.4744	-0.7974	-0.9585	-0.6271	-0.7026
-0.4917	-0.8286	-0.8468	-0.7316	0.1373	-0.6215	-0.8434
0.7055	-0.8927	0.2798	-0.1105	-0.9336	0.7403	0.9078
0.7782	0.7528	0.9530	0.8946	0.8736	0.8964	0.5665
0.8774	0.9605	0.6104	0.9621	0.9733	0.9634	0.0988
0.8037	-0.1849	-0.2911	0.9593	0.8537	0.9388	0.8069
0.9549	0.8283	0.8098	-0.5212	0.6266	0.9042	0.8168

-0.1868	0.8554	0.8978	1.0000				
-0.7716	-0.7440	-0.4402	-0.6709	-0.7717	-0.4636	-0.5333	
-0.5226	-0.7974	-0.6939	-0.5620	-0.0184	-0.5685	-0.7022	
0.6548	-0.7081	0.2638	0.2291	-0.7026	0.6505	0.7267	
0.6494	0.6281	0.8282	0.7826	0.8009	0.7682	0.5877	
0.8120	0.7963	0.5529	0.8496	0.8730	0.8362	0.0455	
0.7451	-0.1491	-0.1047	0.8502	0.7249	0.7346	0.7325	
0.7586	0.6217	0.7844	-0.3818	0.5374	0.6739	0.7029	
-0.2469	0.7414	0.7950	0.8005	1.0000			
-0.8226	-0.8814	-0.3387	-0.8653	-0.9524	-0.6503	-0.8026	
-0.6098	-0.7323	-0.7292	-0.7878	0.0632	-0.5144	-0.8315	
0.5870	-0.9125	0.1440	-0.1104	-0.9227	0.6910	0.9091	
0.8384	0.8331	0.9352	0.8117	0.7930	0.8359	0.5235	
0.8831	0.9316	0.4787	0.9196	0.9253	0.9234	0.1367	
0.7433	-0.2284	-0.2556	0.9795	0.8702	0.9564	0.7639	
0.9650	0.8419	0.8649	-0.6152	0.6862	0.8623	0.8074	
-0.0480	0.7749	0.8282	0.9523	0.7898	1.0000		
-0.8362	-0.5704	-0.4745	-0.4988	-0.6885	-0.2163	-0.3838	
-0.3942	-0.7557	-0.7224	-0.3653	-0.0844	-0.7080	-0.5965	
0.6947	-0.5632	0.4670	0.3552	-0.5959	0.7308	0.6665	
0.5304	0.4277	0.7787	0.8235	0.8079	0.7579	0.7519	
0.8134	0.7215	0.7029	0.8043	0.7924	0.8346	0.2333	
0.8068	-0.0760	0.1219	0.7685	0.7801	0.6135	0.7715	
0.6867	0.5150	0.8518	-0.3460	0.4472	0.6311	0.6493	
-0.3719	0.7078	0.8412	0.7387	0.8400	0.7355	1.0000	
-0.8078	-0.8817	-0.3774	-0.8024	-0.9573	-0.7048	-0.7743	
-0.4911	-0.7097	-0.7544	-0.7664	0.2105	-0.5379	-0.8165	
0.6006	-0.8769	0.2174	-0.2165	-0.9144	0.6979	0.9358	
0.7588	0.8090	0.8924	0.8312	0.8339	0.9066	0.4648	
0.8089	0.9641	0.5239	0.9357	0.9245	0.9170	0.1119	
0.7381	-0.1632	-0.3063	0.9431	0.8278	0.9313	0.8328	
0.9393	0.8001	0.8370	-0.5767	0.5591	0.8958	0.6998	
-0.0463	0.8481	0.8176	0.9477	0.7516	0.9481	0.6752	
							1.0000
							-0.5406 -0.8471 0.0753 -0.8168 -0.8136 -0.8104 -0.8937

-0.6398	-0.4534	-0.3624	-0.8926	-0.1058	-0.1064	-0.7588
0.1597	-0.8471	-0.3242	-0.2679	-0.8265	0.2802	0.7261
0.7305	0.9114	0.6537	0.4479	0.5257	0.6003	0.1391
0.7285	0.7824	0.0525	0.7000	0.6798	0.6946	-0.1828
0.4566	-0.3148	-0.3112	0.8206	0.6795	0.8349	0.5084
0.8137	0.7722	0.6915	-0.7874	0.7120	0.5541	0.6360
0.1809	0.5055	0.4530	0.7181	0.6621	0.8003	0.4637
0.7786	1.0000					
0.3083	0.4479	0.2162	0.2905	0.4426	0.5567	0.3777
-0.1345	0.3006	0.3652	0.5267	-0.2834	0.0770	0.1394
-0.1114	0.4602	0.0740	0.5511	0.5113	-0.0550	-0.3020
-0.1118	-0.3954	-0.2574	-0.3063	-0.4231	-0.4085	-0.0133
-0.2623	-0.4491	-0.1438	-0.4097	-0.3630	-0.3964	0.3508
-0.1163	0.2008	0.6260	-0.3194	-0.2288	-0.4220	-0.2116
-0.4242	-0.4365	-0.1211	0.4889	-0.2617	-0.2524	-0.2819
0.2081	-0.2962	-0.2115	-0.4121	-0.1363	-0.3350	-0.0251
-0.3864	-0.3719	1.0000				
-0.8523	-0.8802	-0.4492	-0.7800	-0.9632	-0.6849	-0.7287
-0.4780	-0.7627	-0.8108	-0.7698	0.2043	-0.5784	-0.8055
0.6457	-0.8893	0.2583	-0.1610	-0.9283	0.6920	0.9060
0.7262	0.7863	0.9088	0.8664	0.8918	0.9162	0.5368
0.8556	0.9714	0.5741	0.9592	0.9522	0.9549	0.0922
0.7723	-0.2243	-0.3229	0.9525	0.8584	0.9249	0.8296
0.9507	0.8259	0.8240	-0.5834	0.5649	0.8680	0.7650
-0.1698	0.8573	0.8664	0.9644	0.7799	0.9452	0.7216
0.9724	0.7584	-0.4657	1.0000			
-0.2056	0.1764	-0.5010	0.1042	0.0934	0.4587	0.4548
0.0823	-0.2256	-0.3676	0.4013	0.2039	-0.3171	0.0556
0.4720	0.1048	0.5913	0.4735	0.1376	0.4323	-0.0796
-0.0092	-0.3316	0.1799	0.3102	0.2240	0.0608	0.4696
0.0915	-0.0735	0.4573	0.0629	0.1319	0.0676	0.4391
0.2773	-0.0507	0.1092	-0.0438	0.0118	-0.0852	0.0486
-0.0365	-0.0306	-0.0064	0.4555	-0.2980	0.0998	0.1063
-0.4219	0.1281	0.3127	0.0678	0.0704	-0.0707	0.2238
-0.0730	-0.4710	0.1080	-0.0036	1.0000		

-0.2021	-0.2378	-0.4858	-0.0596	-0.1373	-0.0669	0.1136
-0.0156	-0.6022	-0.4033	-0.0256	-0.0003	-0.3695	-0.1369
0.5259	-0.0740	0.3281	0.3040	-0.1154	0.2830	0.1112
-0.0013	-0.0194	0.2659	0.3217	0.3436	0.2931	0.2201
0.1805	0.2544	0.4307	0.3054	0.3872	0.2599	-0.2619
0.2222	0.1496	-0.1870	0.2154	0.0044	0.1248	0.1859
0.0811	-0.0621	0.1290	0.2667	0.0314	0.1903	0.2531
-0.3443	0.4316	0.3227	0.2344	0.5166	0.1500	0.4145
0.1174	0.0218	-0.0193	0.1744	0.3031	1.0000	
-0.9121	-0.8336	-0.5499	-0.6997	-0.9411	-0.5999	-0.6523
-0.3672	-0.8468	-0.8826	-0.6767	0.1641	-0.7072	-0.7650
0.7520	-0.8319	0.3806	-0.0901	-0.8983	0.7360	0.8816
0.6615	0.6820	0.9080	0.9345	0.9446	0.9524	0.6272
0.8506	0.9604	0.7016	0.9867	0.9648	0.9844	0.0675
0.8183	-0.1193	-0.2615	0.9312	0.8553	0.8742	0.8758
0.9118	0.7609	0.8237	-0.5235	0.5475	0.8772	0.7486
-0.3087	0.8856	0.9199	0.9687	0.8196	0.9193	0.8055
0.9347	0.6757	-0.4425	0.9650	0.0794	0.2754	1.0000
-0.7322	-0.7763	-0.2854	-0.8460	-0.8545	-0.6127	-0.6961
-0.5732	-0.6054	-0.6451	-0.7291	0.0787	-0.3467	-0.7487
0.4532	-0.8613	0.1193	-0.1746	-0.8413	0.5562	0.7710
0.7403	0.7831	0.8564	0.6937	0.6952	0.7027	0.4295
0.7684	0.8139	0.3747	0.7972	0.8094	0.8045	0.1283
0.6279	-0.4196	-0.3030	0.8236	0.7575	0.8758	0.5804
0.8790	0.8372	0.6231	-0.5555	0.5620	0.7665	0.7114
-0.1105	0.6273	0.6992	0.8504	0.6056	0.8267	0.5053
0.8296	0.6793	-0.4942	0.8451	0.0765	0.0627	0.7877
1.0000						
0.5010	0.8368	0.1869	0.7337	0.8152	0.7956	0.8210
0.3298	0.5584	0.5399	0.8239	-0.2687	0.2264	0.6662
-0.3429	0.8227	0.1004	0.5205	0.8478	-0.4531	-0.7668
-0.6659	-0.8034	-0.6630	-0.5763	-0.5769	-0.6917	-0.1155
-0.5834	-0.8222	-0.2338	-0.7326	-0.7323	-0.6940	0.1947
-0.4229	0.0726	0.5855	-0.7744	-0.5439	-0.8556	-0.5457
-0.8063	-0.7158	-0.5643	0.5970	-0.6144	-0.6994	-0.6026

-0.1436	-0.6510	-0.5010	-0.7899	-0.5120	-0.8009	-0.3275
-0.8327	-0.7767	0.6082	-0.7977	0.2924	-0.0744	-0.7405
-0.7077	1.0000					
0.6967	0.6760	0.1900	0.8020	0.8201	0.5091	0.6796
0.6601	0.4735	0.5644	0.6561	0.0272	0.3905	0.7805
-0.4226	0.7952	-0.0384	0.0908	0.8049	-0.5238	-0.7756
-0.8016	-0.7126	-0.8009	-0.6275	-0.5701	-0.6042	-0.4343
-0.7487	-0.7164	-0.2922	-0.7058	-0.7136	-0.7340	-0.3122
-0.6382	0.3478	0.0774	-0.8170	-0.8009	-0.8184	-0.5886
-0.8355	-0.8036	-0.6963	0.5234	-0.6081	-0.7718	-0.6848
-0.0176	-0.5202	-0.7088	-0.7946	-0.5376	-0.8374	-0.5009
-0.7936	-0.6566	0.1766	-0.7714	0.0548	0.1923	-0.7129
-0.7625	0.5971	1.0000				
-0.6140	-0.8978	-0.3344	-0.6562	-0.8634	-0.8810	-0.8070
-0.3059	-0.7096	-0.6512	-0.8185	0.0305	-0.4969	-0.7614
0.4899	-0.7356	-0.0374	-0.4947	-0.8776	0.3481	0.8291
0.5221	0.6714	0.6576	0.6086	0.6430	0.8201	0.1148
0.5825	0.8842	0.4139	0.8014	0.7719	0.7571	-0.3237
0.4507	0.0807	-0.4219	0.7800	0.5747	0.7859	0.7029
0.7503	0.5699	0.6178	-0.5117	0.5983	0.7705	0.5399
0.0333	0.7792	0.6158	0.7971	0.6305	0.7937	0.4943
0.8353	0.8034	-0.4426	0.8157	-0.3484	0.1677	0.7949
0.6260	-0.8300	-0.5993	1.0000			
-0.8972	-0.7434	-0.5931	-0.6796	-0.8882	-0.4415	-0.5387
-0.4420	-0.8320	-0.8845	-0.5692	0.1295	-0.7569	-0.7918
0.7995	-0.7667	0.4441	0.0767	-0.8320	0.7787	0.8570
0.7206	0.5936	0.9395	0.9271	0.8847	0.8663	0.7088
0.8522	0.8725	0.7386	0.9179	0.9434	0.9472	0.2599
0.8731	-0.1295	-0.1080	0.9021	0.8601	0.8476	0.8310
0.8752	0.7480	0.7885	-0.3647	0.5047	0.8924	0.7798
-0.2913	0.8332	0.9600	0.9464	0.7884	0.8928	0.7946
0.8685	0.5597	-0.2522	0.9006	0.2013	0.2603	0.9358
0.7566	-0.6158	-0.7833	0.6732	1.0000		
-0.8936	-0.8322	-0.4337	-0.7782	-0.9390	-0.5519	-0.6915
-0.5179	-0.7884	-0.8119	-0.7089	0.0528	-0.6112	-0.7921

0.6595	-0.8793	0.2795	0.0137	-0.9023	0.7329	0.8473
0.7617	0.7467	0.9357	0.9033	0.8923	0.8762	0.6253
0.9124	0.9253	0.5879	0.9543	0.9471	0.9731	0.1748
0.8480	-0.2650	-0.2474	0.9597	0.8956	0.8938	0.8080
0.9436	0.8321	0.8817	-0.6013	0.6243	0.8179	0.8273
-0.2309	0.8121	0.8972	0.9583	0.8329	0.9463	0.8319
0.9200	0.7149	-0.3740	0.9505	0.0862	0.2145	0.9624
0.8063	-0.7074	-0.7742	0.7297	0.9213	1.0000	
-0.8826	-0.8355	-0.4599	-0.7384	-0.9552	-0.6342	-0.7154
-0.4060	-0.7357	-0.8084	-0.7073	0.2202	-0.6270	-0.7829
0.6289	-0.8239	0.2886	-0.1602	-0.8885	0.7129	0.9354
0.7218	0.7273	0.9009	0.8815	0.8795	0.9356	0.5600
0.8299	0.9462	0.6311	0.9444	0.9198	0.9516	0.1700
0.8002	-0.1095	-0.2100	0.9242	0.8584	0.9128	0.8837
0.9399	0.7878	0.8560	-0.5626	0.5439	0.8728	0.6962
-0.1215	0.8443	0.8658	0.9515	0.7422	0.9331	0.7294
0.9622	0.7140	-0.4313	0.9620	-0.0059	0.1064	0.9580
0.8080	-0.7793	-0.7714	0.7993	0.9084	0.9385	1.0000
0.2128	0.5133	0.0590	0.2847	0.4558	0.8155	0.5489
-0.0615	0.2155	0.2016	0.6181	-0.1318	0.0586	0.1961
0.0199	0.3824	0.2485	0.7044	0.4854	0.1858	-0.3378
-0.0088	-0.4289	-0.1090	-0.1411	-0.2952	-0.4440	0.3319
-0.0514	-0.4728	-0.0046	-0.3628	-0.2695	-0.2913	0.5427
0.0420	0.0391	0.5985	-0.2864	-0.1316	-0.3465	-0.2808
-0.3228	-0.2460	-0.1227	0.4740	-0.2234	-0.2661	-0.0657
-0.0505	-0.3384	-0.0847	-0.3072	-0.1371	-0.3027	0.0540
-0.4332	-0.5144	0.6983	-0.4132	0.4967	0.0571	-0.3578
-0.3453	0.6137	0.1733	-0.6473	-0.1152	-0.2662	-0.3925
			1.0000			
-0.8651	-0.8603	-0.4318	-0.8433	-0.9460	-0.5948	-0.6928
-0.6101	-0.8175	-0.8074	-0.7335	0.0464	-0.5856	-0.8591
0.6736	-0.8929	0.2460	-0.0014	-0.9094	0.7176	0.8802
0.8046	0.7700	0.9679	0.8674	0.8584	0.8532	0.5917
0.9202	0.9340	0.5728	0.9402	0.9674	0.9509	0.1497
0.7993	-0.2749	-0.2232	0.9713	0.8751	0.9297	0.7562

0.9536	0.8387	0.8382	-0.5196	0.6377	0.8552	0.8467
-0.1930	0.8075	0.8964	0.9727	0.8478	0.9523	0.7886
0.9166	0.7378	-0.3390	0.9480	0.1003	0.2760	0.9397
0.8548	-0.7183	-0.7987	0.7452	0.9317	0.9595	0.9136
-0.2319	1.0000					
Correlation coefficients (Wrap-around, ERR-15)						
1.0000						
0.9997	1.0000					
0.9988	0.9997	1.0000				
0.9974	0.9989	0.9997	1.0000			
0.9949	0.9971	0.9985	0.9995	1.0000		
0.9924	0.9951	0.9970	0.9986	0.9998	1.0000	
0.9894	0.9927	0.9951	0.9972	0.9990	0.9997	1.0000
0.9862	0.9899	0.9928	0.9954	0.9978	0.9991	0.9998
1.0000						
0.9806	0.9850	0.9884	0.9918	0.9952	0.9971	0.9985
0.9994	1.0000					
0.9725	0.9776	0.9816	0.9857	0.9904	0.9930	0.9953
0.9970	0.9990	1.0000				
0.9574	0.9634	0.9681	0.9734	0.9797	0.9834	0.9869
0.9896	0.9939	0.9978	1.0000			
0.9512	0.9576	0.9627	0.9683	0.9752	0.9794	0.9833
0.9864	0.9914	0.9962	0.9998	1.0000		
0.9473	0.9539	0.9592	0.9652	0.9724	0.9768	0.9810
0.9844	0.9898	0.9951	0.9994	0.9999	1.0000	
0.9216	0.9290	0.9350	0.9421	0.9513	0.9568	0.9622
0.9668	0.9748	0.9836	0.9934	0.9956	0.9965	1.0000
0.8869	0.8951	0.9017	0.9098	0.9208	0.9275	0.9342
0.9400	0.9507	0.9632	0.9790	0.9828	0.9846	0.9958
1.0000						
0.8657	0.8742	0.8811	0.8898	0.9018	0.9090	0.9164
0.9228	0.9349	0.9493	0.9681	0.9729	0.9751	0.9903
0.9989	1.0000					
0.7837	0.7930	0.8005	0.8106	0.8252	0.8339	0.8431
0.8513	0.8675	0.8878	0.9163	0.9238	0.9273	0.9554

0.9784	0.9871	1.0000					
0.5848	0.5946	0.6025	0.6142	0.6325	0.6431	0.6548	
0.6654	0.6880	0.7174	0.7616	0.7733	0.7789	0.8284	
0.8761	0.8980	0.9567	1.0000				
0.3664	0.3758	0.3832	0.3953	0.4154	0.4268	0.4397	
0.4515	0.4781	0.5134	0.5681	0.5828	0.5896	0.6547	
0.7208	0.7528	0.8482	0.9656	1.0000			
0.2935	0.3024	0.3096	0.3214	0.3416	0.3531	0.3661	
0.3780	0.4053	0.4419	0.4990	0.5144	0.5215	0.5904	
0.6614	0.6961	0.8017	0.9409	0.9966	1.0000		
0.2673	0.2760	0.2829	0.2945	0.3147	0.3260	0.3389	
0.3508	0.3783	0.4152	0.4730	0.4885	0.4957	0.5659	
0.6384	0.6740	0.7832	0.9300	0.9935	0.9995	1.0000	
0.2431	0.2516	0.2582	0.2696	0.2897	0.3009	0.3138	
0.3256	0.3531	0.3902	0.4486	0.4643	0.4716	0.5428	
0.6167	0.6532	0.7655	0.9193	0.9898	0.9981	0.9996	
1.0000							
0.2259	0.2341	0.2405	0.2518	0.2716	0.2827	0.2955	
0.3072	0.3348	0.3720	0.4308	0.4465	0.4538	0.5258	
0.6006	0.6376	0.7521	0.9108	0.9864	0.9965	0.9987	
0.9998	1.0000						
0.2137	0.2216	0.2278	0.2389	0.2587	0.2696	0.2823	
0.2939	0.3215	0.3588	0.4177	0.4335	0.4408	0.5132	
0.5887	0.6261	0.7421	0.9043	0.9836	0.9950	0.9976	
0.9992	0.9999	1.0000					
0.2050	0.2128	0.2188	0.2298	0.2493	0.2602	0.2727	
0.2843	0.3118	0.3491	0.4081	0.4239	0.4312	0.5039	
0.5799	0.6175	0.7346	0.8994	0.9813	0.9936	0.9966	
0.9986	0.9995	0.9999	1.0000				
0.1964	0.2040	0.2098	0.2206	0.2401	0.2508	0.2632	
0.2747	0.3022	0.3395	0.3986	0.4144	0.4217	0.4947	
0.5710	0.6090	0.7271	0.8943	0.9788	0.9920	0.9955	
0.9978	0.9990	0.9996	0.9999	1.0000			
0.1927	0.2001	0.2058	0.2165	0.2358	0.2464	0.2588	
0.2702	0.2976	0.3348	0.3939	0.4097	0.4170	0.4900	

0.5666	0.6046	0.7232	0.8915	0.9772	0.9909	0.9946
0.9972	0.9986	0.9993	0.9997	1.0000	1.0000	
0.1881	0.1954	0.2010	0.2115	0.2307	0.2412	0.2535
0.2648	0.2921	0.3293	0.3884	0.4042	0.4114	0.4846
0.5613	0.5995	0.7186	0.8882	0.9754	0.9897	0.9936
0.9964	0.9980	0.9989	0.9995	0.9998	0.9999	1.0000
0.1854	0.1926	0.1980	0.2084	0.2275	0.2379	0.2501
0.2613	0.2885	0.3257	0.3847	0.4005	0.4077	0.4810
0.5577	0.5960	0.7155	0.8859	0.9740	0.9886	0.9928
0.9957	0.9975	0.9985	0.9992	0.9996	0.9998	1.0000
	1.0000					
0.1744	0.1813	0.1866	0.1969	0.2158	0.2261	0.2382
0.2494	0.2766	0.3137	0.3729	0.3887	0.3959	0.4695
0.5468	0.5853	0.7060	0.8793	0.9706	0.9863	0.9909
0.9943	0.9963	0.9976	0.9985	0.9991	0.9995	0.9998
0.9999	1.0000					
0.1714	0.1782	0.1834	0.1936	0.2124	0.2226	0.2347
0.2458	0.2729	0.3100	0.3691	0.3849	0.3922	0.4658
0.5431	0.5818	0.7028	0.8769	0.9691	0.9851	0.9899
0.9935	0.9957	0.9971	0.9980	0.9988	0.9992	0.9995
0.9998	1.0000	1.0000				
0.1641	0.1708	0.1758	0.1859	0.2046	0.2147	0.2267
0.2377	0.2648	0.3019	0.3611	0.3769	0.3841	0.4579
0.5356	0.5744	0.6962	0.8721	0.9664	0.9832	0.9883
0.9922	0.9946	0.9962	0.9973	0.9982	0.9987	0.9992
0.9994	0.9998	0.9999	1.0000			
0.1560	0.1625	0.1675	0.1774	0.1959	0.2060	0.2179
0.2289	0.2559	0.2930	0.3522	0.3680	0.3753	0.4493
0.5273	0.5663	0.6890	0.8669	0.9634	0.9810	0.9865
0.9906	0.9933	0.9951	0.9964	0.9974	0.9980	0.9986
0.9990	0.9995	0.9997	0.9999	1.0000		
0.1451	0.1514	0.1562	0.1660	0.1844	0.1944	0.2062
0.2171	0.2441	0.2812	0.3405	0.3563	0.3636	0.4379
0.5163	0.5557	0.6794	0.8601	0.9595	0.9782	0.9841
0.9886	0.9916	0.9937	0.9951	0.9963	0.9971	0.9978

0.9983	0.9990	0.9993	0.9997	0.9999	1.0000	
0.1358	0.1420	0.1466	0.1563	0.1746	0.1844	0.1962
0.2070	0.2339	0.2710	0.3304	0.3462	0.3535	0.4281
0.5068	0.5464	0.6711	0.8540	0.9560	0.9755	0.9818
0.9867	0.9900	0.9922	0.9938	0.9952	0.9961	0.9969
0.9975	0.9984	0.9988	0.9993	0.9996	0.9999	1.0000
0.1265	0.1325	0.1370	0.1465	0.1647	0.1745	0.1861
0.1969	0.2238	0.2608	0.3203	0.3361	0.3434	0.4182
0.4973	0.5371	0.6627	0.8479	0.9523	0.9728	0.9794
0.9846	0.9882	0.9906	0.9924	0.9940	0.9949	0.9958
0.9965	0.9976	0.9981	0.9987	0.9992	0.9997	0.9999
1.0000						
0.1147	0.1205	0.1249	0.1342	0.1523	0.1620	0.1735
0.1842	0.2111	0.2482	0.3077	0.3236	0.3309	0.4059
0.4855	0.5255	0.6523	0.8403	0.9478	0.9693	0.9764
0.9820	0.9859	0.9886	0.9905	0.9923	0.9934	0.9944
0.9952	0.9965	0.9971	0.9979	0.9986	0.9992	0.9996
0.9999	1.0000					
0.1065	0.1122	0.1165	0.1258	0.1437	0.1533	0.1648
0.1755	0.2023	0.2393	0.2989	0.3148	0.3221	0.3973
0.4771	0.5174	0.6448	0.8347	0.9443	0.9666	0.9739
0.9799	0.9840	0.9869	0.9890	0.9909	0.9921	0.9932
0.9941	0.9955	0.9962	0.9971	0.9979	0.9987	0.9993
0.9997	0.9999	1.0000				
0.0950	0.1005	0.1046	0.1138	0.1316	0.1411	0.1525
0.1631	0.1899	0.2269	0.2866	0.3025	0.3098	0.3852
0.4655	0.5060	0.6345	0.8270	0.9395	0.9629	0.9707
0.9770	0.9814	0.9845	0.9868	0.9889	0.9902	0.9915
0.9924	0.9941	0.9949	0.9959	0.9969	0.9979	0.9986
0.9992	0.9997	0.9999	1.0000			
0.0877	0.0931	0.0971	0.1061	0.1239	0.1333	0.1447
0.1552	0.1819	0.2189	0.2786	0.2945	0.3018	0.3774
0.4578	0.4985	0.6276	0.8217	0.9361	0.9601	0.9682
0.9748	0.9794	0.9827	0.9851	0.9874	0.9887	0.9901
0.9911	0.9930	0.9938	0.9950	0.9960	0.9972	0.9981

0.9987	0.9994	0.9997	0.9999	1.0000			
0.0752	0.0805	0.0843	0.0932	0.1108	0.1201	0.1314	
0.1418	0.1685	0.2055	0.2652	0.2811	0.2885	0.3643	
0.4451	0.4861	0.6163	0.8132	0.9307	0.9559	0.9644	
0.9715	0.9764	0.9799	0.9825	0.9849	0.9864	0.9879	
0.9890	0.9911	0.9920	0.9933	0.9946	0.9960	0.9970	
0.9979	0.9987	0.9992	0.9997	0.9999	1.0000		
0.0696	0.0748	0.0785	0.0873	0.1048	0.1141	0.1253	
0.1357	0.1623	0.1992	0.2590	0.2749	0.2822	0.3581	
0.4391	0.4801	0.6108	0.8088	0.9277	0.9534	0.9622	
0.9694	0.9745	0.9782	0.9809	0.9834	0.9850	0.9866	
0.9878	0.9899	0.9909	0.9923	0.9937	0.9952	0.9963	
0.9973	0.9983	0.9989	0.9994	0.9997	1.0000	1.0000	
0.0560	0.0609	0.0645	0.0732	0.0905	0.0997	0.1108	
0.1211	0.1476	0.1845	0.2443	0.2602	0.2676	0.3437	
0.4251	0.4664	0.5983	0.7993	0.9216	0.9485	0.9577	
0.9655	0.9709	0.9748	0.9778	0.9805	0.9822	0.9839	
0.9852	0.9876	0.9887	0.9903	0.9918	0.9935	0.9948	
0.9960	0.9972	0.9980	0.9988	0.9992	0.9997	0.9999	
1.0000							
0.0415	0.0463	0.0498	0.0583	0.0755	0.0845	0.0955	
0.1057	0.1322	0.1691	0.2289	0.2448	0.2522	0.3286	
0.4104	0.4520	0.5851	0.7892	0.9150	0.9431	0.9529	
0.9611	0.9669	0.9711	0.9742	0.9772	0.9790	0.9808	
0.9822	0.9849	0.9860	0.9878	0.9895	0.9915	0.9930	
0.9944	0.9958	0.9968	0.9978	0.9984	0.9992	0.9995	
0.9999	1.0000						
0.0258	0.0304	0.0336	0.0420	0.0590	0.0679	0.0788	
0.0890	0.1154	0.1522	0.2121	0.2281	0.2354	0.3121	
0.3944	0.4362	0.5706	0.7780	0.9077	0.9371	0.9474	
0.9561	0.9623	0.9667	0.9701	0.9733	0.9752	0.9772	
0.9787	0.9816	0.9829	0.9849	0.9868	0.9890	0.9907	
0.9923	0.9940	0.9952	0.9965	0.9973	0.9983	0.9987	
0.9994	0.9998	1.0000					
0.0103	0.0147	0.0178	0.0260	0.0429	0.0517	0.0625	

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0.0725	0.0989	0.1357	0.1956	0.2115	0.2189	0.2958
0.3785	0.4206	0.5562	0.7668	0.9001	0.9309	0.9417
0.9509	0.9574	0.9622	0.9658	0.9692	0.9712	0.9734
0.9750	0.9781	0.9795	0.9816	0.9838	0.9862	0.9882
0.9900	0.9919	0.9933	0.9948	0.9958	0.9970	0.9976
0.9986	0.9994	0.9998	1.0000			
0.0053	0.0097	0.0127	0.0208	0.0376	0.0463	0.0571
0.0671	0.0934	0.1302	0.1900	0.2060	0.2133	0.2903
0.3730	0.4152	0.5511	0.7626	0.8970	0.9282	0.9392
0.9486	0.9552	0.9601	0.9638	0.9673	0.9694	0.9716
0.9733	0.9765	0.9780	0.9802	0.9824	0.9849	0.9870
0.9889	0.9910	0.9924	0.9940	0.9951	0.9965	0.9971
0.9982	0.9991	0.9997	1.0000	1.0000		
0.0020	0.0062	0.0092	0.0173	0.0340	0.0427	0.0534
0.0634	0.0896	0.1263	0.1861	0.2021	0.2094	0.2864
0.3691	0.4114	0.5474	0.7594	0.8945	0.9260	0.9371
0.9467	0.9534	0.9584	0.9622	0.9657	0.9679	0.9702
0.9719	0.9752	0.9767	0.9790	0.9813	0.9839	0.9860
0.9880	0.9902	0.9916	0.9934	0.9945	0.9959	0.9967
0.9978	0.9988	0.9995	0.9999	1.0000	1.0000	
-0.0038	0.0004	0.0033	0.0113	0.0279	0.0366	0.0472
0.0571	0.0833	0.1200	0.1797	0.1957	0.2030	0.2800
0.3629	0.4052	0.5415	0.7545	0.8909	0.9229	0.9343
0.9440	0.9509	0.9560	0.9599	0.9635	0.9658	0.9681
0.9699	0.9734	0.9749	0.9773	0.9797	0.9824	0.9846
0.9867	0.9890	0.9905	0.9924	0.9936	0.9952	0.9960
0.9973	0.9983	0.9992	0.9997	0.9999	1.0000	1.0000
-0.0095	-0.0054	-0.0026	0.0053	0.0218	0.0304	0.0411
0.0509	0.0770	0.1137	0.1734	0.1893	0.1967	0.2737
0.3566	0.3990	0.5357	0.7497	0.8873	0.9198	0.9313
0.9413	0.9483	0.9536	0.9575	0.9613	0.9636	0.9660
0.9679	0.9714	0.9731	0.9755	0.9780	0.9808	0.9832
0.9853	0.9877	0.9894	0.9914	0.9926	0.9943	0.9952
0.9966	0.9978	0.9988	0.9995	0.9997	0.9999	1.0000
						1.0000

-0.0202	-0.0163	-0.0136	-0.0058	0.0106	0.0191	0.0297
0.0395	0.0655	0.1020	0.1617	0.1776	0.1850	0.2621
0.3453	0.3878	0.5252	0.7413	0.8814	0.9147	0.9266
0.9369	0.9442	0.9496	0.9538	0.9577	0.9601	0.9626
0.9645	0.9683	0.9700	0.9726	0.9752	0.9782	0.9807
0.9831	0.9856	0.9874	0.9896	0.9910	0.9929	0.9938
0.9955	0.9969	0.9981	0.9990	0.9993	0.9996	0.9998
0.9999	1.0000					
-0.0290	-0.0252	-0.0226	-0.0150	0.0013	0.0098	0.0202
0.0300	0.0559	0.0924	0.1521	0.1680	0.1753	0.2525
0.3358	0.3785	0.5165	0.7341	0.8762	0.9102	0.9225
0.9330	0.9406	0.9461	0.9504	0.9545	0.9570	0.9596
0.9616	0.9655	0.9673	0.9700	0.9727	0.9759	0.9785
0.9810	0.9837	0.9856	0.9879	0.9894	0.9915	0.9925
0.9943	0.9960	0.9974	0.9985	0.9989	0.9992	0.9995
0.9997	0.9999	1.0000				
-0.0396	-0.0360	-0.0335	-0.0259	-0.0098	-0.0014	0.0089
0.0186	0.0445	0.0809	0.1405	0.1564	0.1637	0.2410
0.3245	0.3673	0.5060	0.7255	0.8700	0.9049	0.9175
0.9284	0.9362	0.9420	0.9464	0.9506	0.9533	0.9560
0.9580	0.9621	0.9640	0.9668	0.9697	0.9730	0.9758
0.9784	0.9813	0.9834	0.9859	0.9875	0.9898	0.9909
0.9929	0.9947	0.9964	0.9977	0.9982	0.9986	0.9990
0.9993	0.9997	0.9999	1.0000			
-0.0499	-0.0464	-0.0440	-0.0366	-0.0206	-0.0124	-0.0021
0.0075	0.0333	0.0697	0.1292	0.1451	0.1524	0.2297
0.3134	0.3564	0.4957	0.7171	0.8638	0.8996	0.9126
0.9238	0.9318	0.9378	0.9424	0.9467	0.9494	0.9522
0.9544	0.9586	0.9606	0.9636	0.9666	0.9701	0.9730
0.9758	0.9788	0.9810	0.9837	0.9855	0.9879	0.9891
0.9914	0.9934	0.9953	0.9968	0.9974	0.9978	0.9983
0.9988	0.9993	0.9997	0.9999	1.0000		
-0.0624	-0.0591	-0.0568	-0.0495	-0.0337	-0.0255	-0.0153
-0.0058	0.0199	0.0562	0.1156	0.1315	0.1388	0.2162
0.3001	0.3433	0.4833	0.7069	0.8564	0.8932	0.9066

0.9182	0.9265	0.9327	0.9375	0.9420	0.9448	0.9477
0.9499	0.9544	0.9564	0.9596	0.9627	0.9664	0.9695
0.9724	0.9758	0.9781	0.9810	0.9829	0.9855	0.9869
0.9893	0.9916	0.9937	0.9955	0.9962	0.9968	0.9974
0.9979	0.9987	0.9992	0.9996	0.9999	1.0000	
-0.0692	-0.0660	-0.0638	-0.0566	-0.0408	-0.0327	-0.0226
-0.0131	0.0125	0.0487	0.1081	0.1240	0.1314	0.2088
0.2927	0.3359	0.4763	0.7010	0.8518	0.8892	0.9027
0.9145	0.9231	0.9294	0.9342	0.9389	0.9418	0.9448
0.9470	0.9516	0.9537	0.9569	0.9602	0.9640	0.9672
0.9703	0.9737	0.9761	0.9791	0.9811	0.9839	0.9853
0.9879	0.9903	0.9926	0.9946	0.9954	0.9960	0.9967
0.9973	0.9982	0.9988	0.9993	0.9997	1.0000	1.0000
-0.0730	-0.0698	-0.0677	-0.0605	-0.0448	-0.0368	-0.0266
-0.0172	0.0084	0.0445	0.1038	0.1197	0.1271	0.2044
0.2883	0.3316	0.4721	0.6972	0.8487	0.8863	0.9000
0.9120	0.9206	0.9270	0.9319	0.9366	0.9396	0.9426
0.9450	0.9496	0.9518	0.9551	0.9584	0.9623	0.9656
0.9687	0.9722	0.9747	0.9778	0.9799	0.9827	0.9842
0.9869	0.9894	0.9918	0.9938	0.9947	0.9953	0.9961
0.9968	0.9978	0.9984	0.9991	0.9995	0.9999	1.0000
1.0000						
-0.0849	-0.0818	-0.0798	-0.0728	-0.0572	-0.0492	-0.0392
-0.0299	-0.0044	0.0317	0.0909	0.1068	0.1141	0.1915
0.2756	0.3190	0.4601	0.6872	0.8413	0.8799	0.8940
0.9062	0.9151	0.9217	0.9268	0.9317	0.9347	0.9379
0.9403	0.9452	0.9474	0.9508	0.9543	0.9584	0.9618
0.9651	0.9688	0.9715	0.9748	0.9770	0.9800	0.9816
0.9845	0.9873	0.9899	0.9922	0.9932	0.9939	0.9948
0.9956	0.9967	0.9976	0.9984	0.9990	0.9995	0.9998
0.9999	1.0000					
-0.1031	-0.1003	-0.0984	-0.0916	-0.0762	-0.0684	-0.0585
-0.0493	-0.0240	0.0119	0.0711	0.0869	0.0942	0.1717
0.2561	0.2997	0.4419	0.6722	0.8302	0.8702	0.8849
0.8977	0.9070	0.9139	0.9192	0.9243	0.9275	0.9308

0.9333	0.9385	0.9408	0.9444	0.9481	0.9525	0.9562
0.9597	0.9637	0.9665	0.9701	0.9725	0.9758	0.9776
0.9808	0.9839	0.9869	0.9896	0.9907	0.9915	0.9925
0.9935	0.9949	0.9960	0.9970	0.9979	0.9987	0.9992
0.9994	0.9998	1.0000				
-0.1193	-0.1167	-0.1150	-0.1084	-0.0932	-0.0855	-0.0758
-0.0666	-0.0414	-0.0057	0.0534	0.0691	0.0765	0.1540
0.2386	0.2823	0.4254	0.6584	0.8199	0.8612	0.8763
0.8896	0.8993	0.9065	0.9120	0.9173	0.9206	0.9240
0.9267	0.9320	0.9345	0.9383	0.9422	0.9467	0.9506
0.9544	0.9586	0.9617	0.9655	0.9680	0.9717	0.9736
0.9771	0.9805	0.9838	0.9868	0.9880	0.9890	0.9902
0.9913	0.9929	0.9941	0.9954	0.9965	0.9977	0.9983
0.9986	0.9992	0.9998	1.0000			
-0.1386	-0.1361	-0.1347	-0.1282	-0.1133	-0.1058	-0.0962
-0.0872	-0.0622	-0.0266	0.0323	0.0480	0.0553	0.1329
0.2177	0.2617	0.4057	0.6420	0.8075	0.8503	0.8660
0.8799	0.8899	0.8975	0.9032	0.9088	0.9122	0.9158
0.9185	0.9242	0.9267	0.9307	0.9348	0.9397	0.9438
0.9478	0.9524	0.9556	0.9597	0.9625	0.9664	0.9685
0.9723	0.9761	0.9798	0.9832	0.9846	0.9856	0.9869
0.9882	0.9901	0.9916	0.9932	0.9945	0.9960	0.9967
0.9972	0.9981	0.9992	0.9998	1.0000		
-0.1549	-0.1526	-0.1513	-0.1451	-0.1304	-0.1230	-0.1135
-0.1047	-0.0798	-0.0444	0.0143	0.0300	0.0373	0.1148
0.1998	0.2439	0.3888	0.6276	0.7965	0.8405	0.8568
0.8711	0.8815	0.8893	0.8953	0.9010	0.9046	0.9083
0.9111	0.9170	0.9197	0.9238	0.9281	0.9332	0.9376
0.9417	0.9466	0.9500	0.9544	0.9573	0.9615	0.9637
0.9679	0.9719	0.9760	0.9797	0.9812	0.9823	0.9838
0.9852	0.9873	0.9890	0.9908	0.9924	0.9941	0.9951
0.9956	0.9968	0.9982	0.9992	0.9998	1.0000	
-0.1703	-0.1683	-0.1672	-0.1611	-0.1466	-0.1394	-0.1300
-0.1213	-0.0966	-0.0613	-0.0028	0.0129	0.0201	0.0976
0.1827	0.2269	0.3725	0.6136	0.7857	0.8309	0.8476

0.8624	0.8731	0.8812	0.8874	0.8933	0.8969	0.9008
0.9037	0.9098	0.9126	0.9169	0.9214	0.9267	0.9313
0.9356	0.9407	0.9443	0.9489	0.9520	0.9565	0.9588
0.9632	0.9676	0.9720	0.9760	0.9776	0.9788	0.9804
0.9820	0.9843	0.9862	0.9882	0.9901	0.9920	0.9931
0.9938	0.9952	0.9970	0.9983	0.9993	0.9998	1.0000
-0.1880	-0.1862	-0.1853	-0.1794	-0.1651	-0.1581	-0.1489
-0.1403	-0.1158	-0.0807	-0.0224	-0.0068	0.0004	0.0778
0.1630	0.2074	0.3537	0.5975	0.7732	0.8197	0.8370
0.8523	0.8634	0.8717	0.8781	0.8843	0.8880	0.8920
0.8950	0.9014	0.9043	0.9088	0.9134	0.9190	0.9238
0.9284	0.9337	0.9376	0.9424	0.9457	0.9504	0.9529
0.9577	0.9623	0.9671	0.9714	0.9732	0.9745	0.9763
0.9780	0.9806	0.9827	0.9849	0.9870	0.9893	0.9905
0.9913	0.9930	0.9952	0.9969	0.9984	0.9993	0.9998
1.0000						
-0.2062	-0.2046	-0.2038	-0.1981	-0.1841	-0.1772	-0.1682
-0.1597	-0.1355	-0.1006	-0.0426	-0.0271	-0.0199	0.0575
0.1427	0.1872	0.3343	0.5808	0.7601	0.8079	0.8257
0.8415	0.8530	0.8616	0.8682	0.8746	0.8785	0.8826
0.8857	0.8924	0.8953	0.9000	0.9049	0.9108	0.9157
0.9206	0.9262	0.9302	0.9353	0.9388	0.9438	0.9465
0.9515	0.9565	0.9616	0.9664	0.9682	0.9696	0.9716
0.9734	0.9763	0.9786	0.9811	0.9835	0.9860	0.9874
0.9883	0.9903	0.9930	0.9950	0.9970	0.9982	0.9991
0.9998	1.0000					
-0.2219	-0.2205	-0.2199	-0.2144	-0.2007	-0.1939	-0.1851
-0.1767	-0.1526	-0.1180	-0.0602	-0.0448	-0.0376	0.0396
0.1249	0.1694	0.3171	0.5658	0.7482	0.7972	0.8155
0.8317	0.8435	0.8524	0.8592	0.8658	0.8698	0.8740
0.8772	0.8841	0.8871	0.8920	0.8970	0.9031	0.9083
0.9133	0.9192	0.9234	0.9287	0.9323	0.9377	0.9404
0.9458	0.9511	0.9565	0.9615	0.9635	0.9650	0.9671
0.9690	0.9721	0.9746	0.9774	0.9800	0.9828	0.9844
0.9853	0.9876	0.9906	0.9930	0.9954	0.9970	0.9982

∞

0.9992	0.9998	1.0000					
-0.2345	-0.2333	-0.2328	-0.2275	-0.2139	-0.2073	-0.1985	
-0.1903	-0.1664	-0.1320	-0.0743	-0.0590	-0.0519	0.0252	
0.1105	0.1550	0.3031	0.5534	0.7382	0.7882	0.8068	
0.8233	0.8355	0.8445	0.8515	0.8582	0.8623	0.8666	
0.8699	0.8770	0.8801	0.8851	0.8903	0.8966	0.9019	
0.9071	0.9131	0.9175	0.9230	0.9268	0.9323	0.9352	
0.9408	0.9463	0.9520	0.9573	0.9594	0.9610	0.9631	
0.9652	0.9685	0.9712	0.9741	0.9768	0.9799	0.9816	
0.9826	0.9851	0.9885	0.9911	0.9938	0.9957	0.9972	
0.9985	0.9994	0.9999	1.0000				
-0.2425	-0.2414	-0.2410	-0.2358	-0.2223	-0.2158	-0.2071	
-0.1990	-0.1752	-0.1409	-0.0835	-0.0681	-0.0611	0.0159	
0.1011	0.1457	0.2939	0.5451	0.7313	0.7818	0.8007	
0.8175	0.8298	0.8390	0.8460	0.8529	0.8570	0.8614	
0.8648	0.8720	0.8752	0.8803	0.8855	0.8919	0.8974	
0.9027	0.9089	0.9134	0.9190	0.9229	0.9285	0.9315	
0.9372	0.9429	0.9488	0.9542	0.9564	0.9580	0.9603	
0.9625	0.9659	0.9687	0.9717	0.9746	0.9778	0.9796	
0.9807	0.9834	0.9869	0.9897	0.9926	0.9947	0.9964	
0.9979	0.9990	0.9997	0.9999	1.0000			
-0.2569	-0.2559	-0.2557	-0.2507	-0.2375	-0.2311	-0.2225	
-0.2145	-0.1909	-0.1568	-0.0997	-0.0844	-0.0774	-0.0005	
0.0846	0.1292	0.2778	0.5308	0.7197	0.7712	0.7905	
0.8077	0.8203	0.8297	0.8369	0.8440	0.8482	0.8527	
0.8561	0.8636	0.8668	0.8721	0.8775	0.8841	0.8898	
0.8952	0.9016	0.9063	0.9122	0.9162	0.9221	0.9251	
0.9311	0.9371	0.9432	0.9490	0.9513	0.9530	0.9554	
0.9577	0.9613	0.9643	0.9675	0.9706	0.9740	0.9760	
0.9772	0.9801	0.9840	0.9871	0.9904	0.9928	0.9948	
0.9967	0.9981	0.9991	0.9996	0.9999	1.0000		
-0.2694	-0.2687	-0.2686	-0.2637	-0.2507	-0.2444	-0.2360	
-0.2280	-0.2046	-0.1708	-0.1139	-0.0987	-0.0917	-0.0150	
0.0700	0.1146	0.2635	0.5180	0.7091	0.7616	0.7812	
0.7987	0.8115	0.8212	0.8286	0.8357	0.8401	0.8447	

0.8482	0.8558	0.8591	0.8645	0.8701	0.8769	0.8827
0.8883	0.8949	0.8997	0.9058	0.9099	0.9160	0.9192
0.9254	0.9316	0.9380	0.9440	0.9464	0.9482	0.9507
0.9532	0.9570	0.9601	0.9636	0.9668	0.9705	0.9726
0.9739	0.9769	0.9811	0.9846	0.9882	0.9909	0.9931
0.9953	0.9971	0.9983	0.9991	0.9995	0.9999	1.0000
-0.2851	-0.2845	-0.2846	-0.2799	-0.2671	-0.2610	-0.2527
-0.2449	-0.2217	-0.1881	-0.1315	-0.1164	-0.1095	-0.0331
0.0519	0.0965	0.2458	0.5021	0.6961	0.7496	0.7696
0.7876	0.8007	0.8106	0.8182	0.8255	0.8300	0.8347
0.8383	0.8461	0.8495	0.8550	0.8608	0.8678	0.8738
0.8796	0.8865	0.8914	0.8978	0.9021	0.9084	0.9117
0.9182	0.9247	0.9314	0.9377	0.9402	0.9421	0.9448
0.9473	0.9514	0.9547	0.9584	0.9619	0.9658	0.9680
0.9694	0.9728	0.9774	0.9811	0.9851	0.9882	0.9908
0.9933	0.9955	0.9971	0.9981	0.9987	0.9994	0.9998
1.0000						
-0.3013	-0.3010	-0.3012	-0.2967	-0.2842	-0.2782	-0.2701
-0.2625	-0.2395	-0.2062	-0.1500	-0.1350	-0.1280	-0.0519
0.0329	0.0776	0.2272	0.4854	0.6822	0.7368	0.7574
0.7757	0.7892	0.7993	0.8071	0.8146	0.8191	0.8240
0.8277	0.8357	0.8392	0.8449	0.8509	0.8581	0.8643
0.8703	0.8774	0.8825	0.8891	0.8935	0.9002	0.9036
0.9104	0.9171	0.9242	0.9308	0.9335	0.9355	0.9383
0.9409	0.9452	0.9487	0.9527	0.9564	0.9605	0.9630
0.9645	0.9681	0.9730	0.9772	0.9816	0.9850	0.9879
0.9909	0.9935	0.9954	0.9967	0.9975	0.9986	0.9993
0.9998	1.0000					

STATUS (TABLE) Data received from R.J.Casperson,
 (APRVD) Proof-read by Robert Casperson (2018-04-13)

HISTORY (20180417R) EXFOR file compiled for GMA by
 Denise Neudecker based on the EXFOR file from
 Naohiko Otsuka and discussions with R.J.Casperson,
 L.Snyder, N.Bowden, M.White and P.Talou from
 (2018-03-29) to (2018-04-17).

(20180403R) DN. Received from R.J.Casperson.
 (20180407C) Otsuka Naohiko made the EXFOR
 file which is the basis for the EXFOR like
 GMA input file.

ENDBIB	946	0					
NOCOMMON	0	0					
ENDSUBENT	949	0					
SUBENT	Z8030002	20180417					
BIB	2	4					
REACTION	((92-U-238(N,F),,SIG,,REL)/(92-U-235(N,F),,SIG,, REL)) shape cross section ratio						
MONITOR	((92-U-238(N,F),,SIG)/(92-U-235(N,F),,SIG)) Ratio normalized to ENDF/B-VIII.0beta3 at 14.5 MeV						
ENDBIB	4	0					
COMMON	2	3					
EN-NRM	MONIT						
MEV	NO-DIM						
14.5	0.5661						
ENDCOMMON	3	0					
DATA	8	72					
EN	EN-ERR	DATA	ERR-S	ERR-14	ERR-15	ERR-16	ERR-17
MEV	PER-CENT	ARB-UNIT	PER-CENT	PER-CENT	PER-CENT	PER-CENT	PER-CENT
0.5160	0.2252	0.001	49.679	9.327	33.005	1.221	59.810
0.5465	0.2311	0.001	48.328	5.690	31.361	1.112	61.375
0.5790	0.2371	0.001	59.365	5.903	39.701	1.026	73.778
0.6135	0.2434	0.001	43.531	4.530	26.828	0.912	60.892
0.6495	0.2498	0.003	20.696	4.513	10.979	0.927	32.405
0.6880	0.2565	0.003	19.119	1.880	9.577	0.846	29.881
0.7290	0.2634	0.003	16.568	1.400	7.889	0.840	26.340
0.7720	0.2704	0.004	14.800	1.319	6.873	0.746	23.846
0.8175	0.2777	0.006	9.746	1.090	4.004	0.741	15.536
0.8660	0.2852	0.009	6.837	0.914	2.395	0.681	10.155
0.9175	0.2930	0.015	4.598	0.457	1.355	0.442	6.205
0.9720	0.3011	0.016	4.424	0.154	1.207	0.481	5.885
1.0295	0.3093	0.015	4.409	0.509	1.218	0.445	5.984

1.0905	0.3178	0.023	3.373	0.203	0.774	0.432	3.967
1.1555	0.3267	0.033	2.684	0.247	0.542	0.374	2.839
1.2240	0.3357	0.037	2.539	0.325	0.475	0.335	2.498
1.2965	0.3450	0.057	1.989	0.101	0.337	0.276	1.616
1.3735	0.3547	0.114	1.384	0.074	0.220	0.199	0.812
1.4545	0.3645	0.224	1.024	0.167	0.175	0.165	0.411
1.5405	0.3747	0.293	0.920	0.059	0.164	0.141	0.315
1.6320	0.3853	0.322	0.882	0.095	0.158	0.135	0.286
1.7285	0.3961	0.356	0.860	0.087	0.151	0.153	0.260
1.8310	0.4072	0.383	0.834	0.111	0.147	0.126	0.243
1.9395	0.4187	0.402	0.823	0.131	0.145	0.120	0.232
2.0540	0.4305	0.411	0.796	0.094	0.141	0.119	0.226
2.1760	0.4428	0.421	0.814	0.108	0.138	0.133	0.221
2.3050	0.4554	0.419	0.812	0.143	0.134	0.127	0.222
2.4415	0.4683	0.419	0.819	0.059	0.134	0.121	0.221
2.5865	0.4817	0.416	0.831	0.065	0.133	0.116	0.223
2.7395	0.4954	0.432	0.819	0.145	0.133	0.129	0.215
2.9015	0.5095	0.425	0.837	0.068	0.131	0.155	0.219
3.0735	0.5240	0.428	0.837	0.156	0.129	0.122	0.217
3.2560	0.5391	0.436	0.845	0.140	0.128	0.129	0.213
3.4490	0.5545	0.451	0.845	0.226	0.127	0.130	0.207
3.6530	0.5704	0.461	0.866	0.042	0.128	0.124	0.202
3.8695	0.5868	0.472	0.853	0.051	0.126	0.139	0.197
4.0990	0.6037	0.485	0.851	0.051	0.124	0.116	0.191
4.3420	0.6210	0.489	0.883	0.040	0.124	0.128	0.190
4.5995	0.6389	0.503	0.878	0.164	0.124	0.141	0.185
4.8720	0.6573	0.504	0.904	0.089	0.126	0.134	0.185
5.1605	0.6763	0.521	0.922	0.137	0.129	0.136	0.178
5.4660	0.6958	0.519	0.945	0.072	0.131	0.135	0.180
5.7900	0.7159	0.540	0.956	0.159	0.132	0.120	0.172
6.1335	0.7366	0.565	0.928	0.080	0.121	0.132	0.164
6.4965	0.7578	0.589	0.859	0.062	0.104	0.132	0.157
6.8810	0.7797	0.614	0.821	0.056	0.092	0.117	0.150
7.2890	0.8023	0.597	0.821	0.031	0.086	0.111	0.155
7.7210	0.8255	0.574	0.823	0.068	0.083	0.134	0.161

8.1785	0.8494	0.565	0.851	0.038	0.083	0.117	0.164
8.6635	0.8741	0.555	0.861	0.048	0.083	0.119	0.167
9.1770	0.8994	0.562	0.894	0.063	0.085	0.125	0.165
9.7205	0.9255	0.564	0.931	0.160	0.089	0.138	0.165
10.2965	0.9524	0.572	0.949	0.162	0.093	0.121	0.163
10.9065	0.9800	0.575	0.997	0.063	0.098	0.146	0.161
11.5525	1.0084	0.581	1.032	0.107	0.101	0.146	0.160
12.2370	1.0377	0.566	1.066	0.088	0.102	0.151	0.165
12.9620	1.0679	0.543	1.084	0.141	0.098	0.131	0.172
13.7300	1.0989	0.544	1.075	0.105	0.094	0.148	0.171
14.5435	1.1308	0.566	1.052	0.061	0.089	0.150	0.164
15.4055	1.1637	0.584	1.048	0.138	0.086	0.142	0.160
16.3185	1.1976	0.612	1.065	0.049	0.087	0.145	0.152
17.2855	1.2324	0.633	1.071	0.034	0.086	0.155	0.147
18.3095	1.2683	0.650	1.092	0.210	0.087	0.133	0.143
19.3945	1.3052	0.678	1.105	0.056	0.087	0.139	0.137
20.5440	1.3432	0.710	1.126	0.076	0.086	0.139	0.131
21.7610	1.3823	0.734	1.079	0.055	0.081	0.139	0.126
23.0505	1.4225	0.746	1.070	0.096	0.077	0.141	0.125
24.4165	1.4640	0.734	1.076	0.125	0.074	0.127	0.126
25.8630	1.5066	0.744	1.071	0.150	0.072	0.144	0.125
27.3955	1.5505	0.740	1.102	0.180	0.071	0.157	0.126
29.0190	1.5957	0.750	1.073	0.047	0.067	0.140	0.124
30.7385	1.6422	0.765	1.071	0.128	0.064	0.127	0.121
ENDDATA	148	0					
ENDSUBENT	87	0					
ENDENTRY	2	0					

4 Summary

An EXFOR formatted GMA information file for $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data was prepared based on an EXFOR file compiled by N. Otuka, information provided by R.J. Casperson and discussions with R.J. Casperson, N. Bowden, L. Snyder, K.T. Schmitt, M.C. White and P. Talou. This file, the approximations made and the input file for preparing part of the data are described in this report. This report also documents part of the private communications taking place as part of preparing this files. This document will be delivered to Neutron Data Standards evaluators to facilitate the inclusion of $^{238}\text{U}(\text{n},\text{f})/^{235}\text{U}(\text{n},\text{f})$ fissionTPC data into the database and code GMA underlying the standards evaluation.

Acknowledgments

Work at Los Alamos National Laboratory was carried out under the auspices of the NNSA of the U.S. Department of Energy at Los Alamos National Laboratory under Contract No. DE-AC52-06NA25396. Work at Lawrence Livermore National Laboratory was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. DE-AC52-07NA27344.

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A ARIADNE Data, Relative Uncertainties and Correlation Matrix Output Files

The **ARIADNE** output files containing the data, relative uncertainties and correlation matrices are provided below.

#	Einc (MeV)	Data(none)	Ratio Data(none)	Total (%)	Ratio (%)	Isotope (%)	Reference unc. (%)	Eunc. Unc. (%)
0.516	0.00113398555563	0.001	84.9931069782	84.9898424195	84.9885459106	0.744929058722	0.469444881561	
0.5465	0.00112650602994	0.001	84.3817119152	84.3787228964	84.3777883924	0.710231034397	0.397119153893	
0.579	0.00112006868261	0.001	102.861028173	102.858715007	102.856521402	0.6898289795	0.671757290175	
0.6135	0.00111471955133	0.001	79.6553466597	79.652772826	79.6484642225	0.640337880242	0.828472013627	
0.6495	0.00333537203636	0.003	40.2585691828	40.2535477462	40.2513773677	0.635835272314	0.418002573959	
0.688	0.0033442700455	0.003	36.8098866048	36.8041306985	36.8018935247	0.650934239587	0.405794868579	
0.729	0.00335262053805	0.003	32.1675319314	32.1612645395	32.1433686007	0.634959667759	1.0727496353	
0.772	0.0044643232	0.004	28.993178348	28.9858684871	28.934514373	0.651013646761	1.72465937211	
0.8175	0.006685023	0.006	18.9114419954	18.90030999	18.8181032254	0.648783961619	1.7608829371	
0.866	0.010108098	0.009	12.8656930196	12.8488393749	12.526123742	0.658318762542	2.86162493745	
0.9175	0.01728435	0.015	7.93637252848	7.90742272785	7.8666299646	0.677255279721	0.802164071088	
0.972	0.019172352	0.016	7.57659788083	7.53611861575	7.47776216525	0.782145547257	0.936032473084	
1.0295	0.017958759375	0.015	8.00587387286	7.98399693836	7.56228583168	0.591446833244	2.56047653996	
1.0905	0.027415755625	0.023	5.94717606141	5.91267091286	5.28593671926	0.639707575086	2.64925467325	
1.1555	0.0395300376033	0.033	4.05630452779	4.01478358146	3.96968840087	0.578894823098	0.600051002817	
1.224	0.0446279773296	0.037	3.75162911704	3.70610132949	3.6235341864	0.582695432776	0.777937699593	
1.2965	0.0692508258838	0.057	5.30542604064	5.27255598941	5.60144632849	0.589659911526	4.58610113947	
1.3735	0.139562908389	0.114	5.62820988208	5.59768784816	1.63348614931	0.58535222844	5.35404821097	
1.4545	0.276422474827	0.224	3.27863157519	3.23043520073	1.14159362297	0.560101258483	3.02199860789	
1.5405	0.364802031082	0.293	1.60689522773	1.50257626689	0.997939376916	0.569540898493	1.12332205437	
1.632	0.404591237928	0.322	1.21464070883	1.07496303498	0.954952354832	0.565514389713	0.493570184039	
1.7285	0.450133698269	0.356	1.16897692238	1.01194760244	0.92788954084	0.585208590991	0.403805584525	
1.831	0.487497444392	0.383	1.13237391026	0.973868871441	0.896889625316	0.577797623631	0.379485940136	
1.9395	0.515263848394	0.402	1.10960991326	0.939240066432	0.885290347852	0.590814909447	0.313740182939	
2.054	0.527747546257	0.411	1.06000183791	0.877964223928	0.852977139201	0.593955148025	0.207969176797	
2.176	0.538055487629	0.421	1.04981180272	0.87467168132	0.871684575979	0.580563752761	0.0722256886711	
2.305	0.532834179935	0.419	1.05767899579	0.87417641117	0.873591437687	0.595399412397	0.0319749565371	
2.4415	0.530014000398	0.419	1.0495469645	0.869552312548	0.869298567812	0.587730896281	0.0210053387803	
2.5865	0.523244805248	0.416	1.06135908595	0.880795498406	0.88071561812	0.592184430153	0.0118621251445	
2.7395	0.538055216905	0.432	1.10081799231	0.879871901942	0.878829334968	0.661532832423	0.0428201334229	
2.9015	0.522113586503	0.425	1.07254030591	0.892398610725	0.891257538538	0.594951617685	0.0451140823212	
3.0735	0.517713265468	0.428	1.0965180571	0.911694334643	0.896392213264	0.609233362282	0.166335684146	
3.256	0.520671293004	0.436	1.10000771813	0.938898935446	0.901120968572	0.57313678033	0.263651684961	
3.449	0.531234423427	0.451	1.12340468414	0.958109560004	0.917049071751	0.586569821395	0.277479601001	
3.653	0.535072423058	0.461	1.10525950113	0.936177054686	0.907900875647	0.587512627206	0.228349464025	
3.8695	0.540701764586	0.472	1.08938788634	0.921007382841	0.896780909699	0.581817297488	0.209853756811	
4.099	0.549049102878	0.485	1.0812212896	0.906427712845	0.890008426926	0.589430469576	0.171744573753	
4.342	0.54906132249	0.489	1.10750205903	0.933742552018	0.921492810607	0.595554915447	0.150751960018	
4.5995	0.557340839756	0.503	1.14069796652	0.953154073115	0.931269026651	0.626649155209	0.203078032034	
4.872	0.546320824554	0.504	1.12366028039	0.946306707846	0.945089413759	0.605901015348	0.0479831774125	
5.1605	0.554209731588	0.521	1.19294728292	0.995922619064	0.967302434609	0.656704923595	0.237039792362	
5.466	0.53998030376	0.519	1.20748262753	1.03023676968	0.982850446406	0.629782894473	0.308857251183	
5.79	0.560014986408	0.54	1.31351066767	1.12302008372	1.00031245119	0.68127539632	0.510440112491	
6.1335	0.649867256333	0.565	1.46045673868	1.21907135347	0.962572075223	0.804238099502	0.748057460933	
6.4965	0.783901931255	0.589	1.30455026353	1.07350293889	0.891411240674	0.741244109773	0.598159309719	
6.881	0.918151467819	0.614	1.17138727039	0.920296522688	0.849605790941	0.72470852594	0.353716962658	
7.289	0.9812152302	0.597	1.26532436929	1.0172971608	0.847787709276	0.752430891266	0.562271743355	
7.721	0.99501336424	0.574	1.20816666817	0.933602054454	0.855990070036	0.766846726529	0.37268457988	
8.1785	1.013553161	0.565	1.14717156356	0.884681349317	0.879271857846	0.730302339037	0.0976836210917	

8.6635 0.992430687565 0.555 1.1557943008 0.89405316901 0.890260635994 0.732481669902 0.082262196771
9.177 0.998529405954 0.562 1.19470546846 0.927049806087 0.923731562739 0.753591277414 0.0783667210367
9.7205 0.995265309106 0.564 1.28732473988 0.975561439455 0.972908526019 0.839931463725 0.0718966073772
10.2965 1.00205617649 0.572 1.30677869417 0.996768436257 0.988283360176 0.845058128188 0.129781799639
10.9065 0.99950735846 0.575 1.35372520357 1.03700737138 1.02704381601 0.870165293771 0.143406026026
11.5525 0.989272711837 0.581 1.36862682176 1.09520036325 1.0647018362 0.820777400756 0.256658987087
12.237 0.994218318414 0.566 1.65317958099 1.48980773487 1.09751081999 0.716572145804 1.00747063822
12.962 1.02054670254 0.543 1.29920937244 1.12759762192 1.11860895759 0.645343781613 0.142092916677
13.73 1.10687382672 0.544 1.28343959759 1.15598395735 1.10753374666 0.557600476163 0.33116145555
14.5435 1.18529750619 0.566 1.5533932834 1.43208883783 1.08062111769 0.601790871883 0.939753392881
15.4055 1.25370343687 0.584 1.62750159717 1.41293086962 1.08190018024 0.807705272036 0.908771501715
16.3185 1.30706865295 0.612 1.53223957937 1.26810047088 1.09010274745 0.860046117569 0.647884869599
17.2855 1.32082961964 0.633 1.4587108981 1.15977649062 1.09600501824 0.884734975028 0.379281568474
18.3095 1.33261377019 0.65 1.6310529175 1.4200119187 1.13237405481 0.802433654841 0.856833034643
19.3945 1.37213640585 0.678 1.93537265843 1.58796466565 1.12686290204 1.10636140009 1.11884394773
20.544 1.4346473 0.71 2.98398617965 2.95346746825 1.14783709646 0.425679966977 2.72129382575
21.761 1.48314242 0.734 1.26605021701 1.26605021701 1.09955627414 0.0 0.62758198827
23.0505 1.50738998 0.746 1.10417730329 1.10417730329 1.09341254794 0.0 0.153806752479
24.4165 1.48314242 0.734 1.79350553959 1.79350553959 1.10040083606 0.0 1.4162556692
25.863 1.50334872 0.744 1.10049616884 1.10049616884 1.10049352565 0.0 0.00241197600525
27.3955 1.4952662 0.74 2.06748622509 2.06748622509 1.13682452472 0.0 1.72688427259
29.019 1.5154725 0.75 1.3724350789 1.3724350789 1.09224676699 0.0 0.831008451093
30.7385 1.54578195 0.765 1.87293912286 1.87293912286 1.09466478887 0.0 1.51974009552

line 2: x-coordinate lattice, line 3: y-coordinate lattice starting line 4: correlation entries, each line a row
0.516 0.5465 0.579 0.6135 0.6495 0.688 0.729 0.772 0.8175 0.866 0.9175 0.972 1.0295 1.0905 1.1555 1.224 1.2965 1.3735 1.4545 1.5405 1.632
1.7285 1.831 1.9395 2.054 2.176 2.305 2.4415 2.5865 2.7395 2.9015 3.0735 3.256 3.449 3.653 3.8695 4.099 4.342 4.5995 4.872 5.1605 5.466
5.79 6.1335 6.4965 6.881 7.289 7.721 8.1785 8.6635 9.177 9.7205 10.2965 10.9065 11.5525 12.237 12.962 13.73 14.5435 15.4055 16.3185
17.2855 18.3095 19.3945 20.544 21.761 23.0505 24.4165 25.863 27.3955 29.019 30.7385
0.516 0.5465 0.579 0.6135 0.6495 0.688 0.729 0.772 0.8175 0.866 0.9175 0.972 1.0295 1.0905 1.1555 1.224 1.2965 1.3735 1.4545 1.5405 1.632
1.7285 1.831 1.9395 2.054 2.176 2.305 2.4415 2.5865 2.7395 2.9015 3.0735 3.256 3.449 3.653 3.8695 4.099 4.342 4.5995 4.872 5.1605 5.466
5.79 6.1335 6.4965 6.881 7.289 7.721 8.1785 8.6635 9.177 9.7205 10.2965 10.9065 11.5525 12.237 12.962 13.73 14.5435 15.4055 16.3185
17.2855 18.3095 19.3945 20.544 21.761 23.0505 24.4165 25.863 27.3955 29.019 30.7385
1.0 0.663165511502 0.659154886999 0.671658540862 0.679908037986 0.671610810126 0.668387739795 0.666238059033 0.65630936773 0.625523896999
0.612965468821 0.600574125312 0.580859752233 0.515988252046 0.540378167884 0.517989490707 0.239197197561 0.118643219663 0.112271152787
0.176087708378 0.219425735088 0.21264839902 0.205251006155 0.20170086496 0.211334604974 0.204924290508 0.201676589318 0.207118849099
0.20487227541 0.193241708709 0.197169752475 0.186588070756 0.179186895124 0.166024828176 0.176206449103 0.17395757275 0.171179056454
0.165629703613 0.152122021869 0.156457530082 0.14271887541 0.142934701832 0.123357719615 0.111514920659 0.119316706333 0.12630169648
0.116695508041 0.130326884332 0.143050773338 0.144396592215 0.13725602312 0.126528253439 0.12323785443 0.122112917443 0.111632537104
0.0823682231463 0.114639368702 0.114183917644 0.0917577922465 0.0881875175635 0.0958390229251 0.1009147181 0.0770141645368 0.0712024983922
0.0393825633102 0.0804065495482 0.0856730146382 0.0568363416578 0.083943888491 0.0487543766258 0.0725793141851 0.0519513286385
0.663165511502 1.0 0.668621054431 0.683592325251 0.691828560189 0.686612885359 0.68426302257 0.682413274983 0.672365933408 0.640571330639
0.62864303018 0.617713085032 0.595618749939 0.529859238369 0.554802582616 0.530668825144 0.244927645753 0.120769705457 0.1129087346
0.18098204101 0.226933447478 0.219857394499 0.212906802811 0.209861882432 0.218955665254 0.212883896399 0.210559497424 0.213829314072
0.211676243437 0.201706952926 0.203842879833 0.194853021661 0.18663211409 0.174917807173 0.181261298505 0.179168491509 0.176343825983
0.17039396946 0.159063986297 0.162048563879 0.148570171218 0.147388328244 0.128523149047 0.114826921084 0.122811774828 0.130957947303
0.120776665279 0.135473187401 0.147718478761 0.149124662923 0.142026963812 0.132735441669 0.129215392676 0.126144257417 0.116367513736
0.0860963329539 0.119914795978 0.118484879683 0.0942905091724 0.0916150615775 0.0985016975227 0.103693970257 0.0809801010031
0.0729427315597 0.0399619044635 0.0826958089598 0.0894447159139 0.0587647601783 0.0884307421181 0.0507445879936 0.0745030628657
0.0537424121667
0.659154886999 0.668621054431 1.0 0.681246252593 0.687889468039 0.683228488541 0.680812260501 0.678903080469 0.668342224992 0.636465820847
0.624129077353 0.612806768681 0.591327934006 0.526288223846 0.549616931887 0.526112159128 0.244461896634 0.121656790671 0.113946349433
0.182226250466 0.227878722939 0.220712269956 0.213900335771 0.21086875853 0.219510421724 0.213165391216 0.210803405692 0.213516017215
0.211277217357 0.201828492672 0.203248899908 0.195078969674 0.186939170425 0.175652859555 0.181058194853 0.178963418434 0.176068482449
0.170012194204 0.159369019278 0.161708787127 0.148859811708 0.147497519654 0.129324297802 0.115619325695 0.123316633398 0.129630124898
0.119002447244 0.133962794327 0.146496412876 0.148274356601 0.141290359266 0.132437070885 0.129071320653 0.125694231618 0.115468063515
0.0844530112778 0.119199329007 0.118372946563 0.0948580029964 0.0923726842319 0.0987728609243 0.103563101258 0.0819751149268
0.0737873091199 0.041420176727 0.0831162974643 0.0887992431211 0.0599611375954 0.0881880645945 0.0521365857391 0.0750734338863
0.0549794629631
0.671658540862 0.683592325251 0.681246252593 1.0 0.713460705899 0.71027375722 0.709428882557 0.708576618189 0.699485996334 0.667886796877
0.655595813437 0.643786005486 0.623017542692 0.55557857884 0.578331515612 0.554993953475 0.260447414485 0.131092591417 0.122102879905
0.192030168637 0.238265083214 0.230460163724 0.223277437736 0.219885738379 0.228578708438 0.221544037729 0.219217301871 0.221968416716
0.219763394157 0.210046331753 0.211308179745 0.203813759246 0.195681304467 0.184016358066 0.189214035076 0.18699400289 0.183829286995
0.177435570351 0.166611031428 0.16836598825 0.155530561161 0.154285730842 0.135891895913 0.122297726574 0.130392848594 0.133873689796
0.122423487818 0.138837927793 0.152987526861 0.155626665361 0.148229688993 0.138939550674 0.135490508348 0.131730404202 0.119717923748
0.0858248423872 0.124278583456 0.124898301505 0.10156238588 0.0989999242152 0.105064360872 0.109384372443 0.087865734562 0.0794867003875
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0.679908037986 0.691828560189 0.687889468039 0.713460705899 1.0 0.730165905011 0.730592674549 0.730929943662 0.724282720497 0.69380650048
0.681622400635 0.66854080333 0.649234234872 0.578343602926 0.603802511002 0.580709919333 0.270996965923 0.135909027875 0.127233096242
0.194641653751 0.239925964509 0.231987574003 0.223609012208 0.219295940525 0.229586067702 0.222095619763 0.21882491711 0.224933797128
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0.180700053244 0.166167860746 0.17005616593 0.155577570519 0.156054831836 0.135281789398 0.123405137835 0.132274306645 0.136308218994
0.125609807507 0.141725011637 0.157013940652 0.159505860955 0.151470588864 0.139621387635 0.135966056027 0.134213703926 0.121064001159
0.0872382815361 0.125450852866 0.126816632386 0.103701319559 0.099908021113 0.107365627836 0.112040234334 0.0872002227119 0.0808673967002

0.0469634153013 0.0900145568959 0.0933383472624 0.0658306829043 0.0924514021475 0.0573027892886 0.0824604947221 0.0607925353914
0.671610810126 0.686612885359 0.683228488541 0.71027375722 0.730165905011 1.0 0.731150398869 0.731853096736 0.72503329401 0.694109197906
0.682873146948 0.671868399145 0.650522316254 0.58091225563 0.604967489382 0.580772531925 0.272529718606 0.136781008958 0.126247328696
0.197843892549 0.245186084765 0.236944231731 0.229512376733 0.225995175645 0.234923829006 0.227810459647 0.225858753424 0.228480302764
0.226428729029 0.21656543556 0.217861786368 0.210606548786 0.202201358465 0.190386454372 0.195061421078 0.192806433379 0.189511184757
0.182901020394 0.172054944628 0.173546517416 0.160276111809 0.158847109268 0.140012466641 0.126081033521 0.134772893295 0.138366056188
0.126734828898 0.144168744525 0.158918523771 0.161821706264 0.154079650936 0.144590203424 0.140857522272 0.136470668244 0.123938464059
0.0887199505658 0.129108819912 0.129878848413 0.105670331226 0.103198000514 0.109142868761 0.113492470937 0.0915512714169 0.0825083845772
0.0483420223107 0.0917582840824 0.0957676228727 0.0682785740309 0.0961435232814 0.0601459819753 0.0840499253525 0.0631987928878
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